

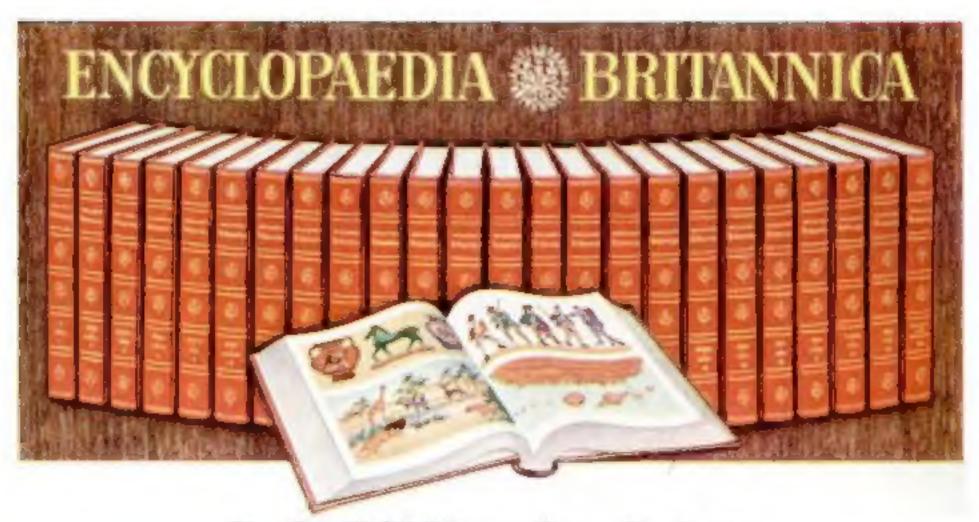
Hottest
Tot Rod

Annual Buyer's Guide to New TVs PAGE 72
Are We Turning into Giants? PAGE 114
New Way to Stop Wood Shrinkage PAGE 11

AT THE RESERVE OF THE PARTY OF

## Now available...direct to you from the Publisher

BRAND NEW EDITION OF THE WORLD FAMOUS



You Get All 24 Volumes Now... Pay Later

## On Easy... Book a Month Payment Plan

Britannica—the greatest treasure of knowledge ever published—is now being offered on a remarkable direct-from-the-publisher plan that puts this world-renowned reference library within reach of every family. All 24 volumes will be placed in your home NOW . . . you pay later on convenient budget terms. It's as easy as buying a book a month,

#### Savings Passed on to You

You may wonder how we're able to make this truly amazing offer. First, because of the great demand for this magnificent set, we have ordered a tremendous printing. This enormous printing materially reduces our costs and, under a remarkable direct-from-the-publisher plan, we pass these savings on to you.

Theesands of Subjects of Precisal Value
In the brand-new edition of
Britannica, you will find thousands of subjects that you and
your family will refer to in the
course of your normal day-today affairs. For example,
you'll find special articles on
household budgets, interior

decorating, medicine and health, home remodeling, child care, adolescent problems, rules and regulations for all sports, every kind of hobby . . . . plus a treasure house of knowledge on all subjects. Useable information that can save you many dollars.

#### New Edition is Professly Illustrated

The new Britannica almost "televises" information with 23,494 magnificent illustrations. But it does not merely show "attractive" pictures—it is the work of 5,565 of the world's greatest authorities.

Britannica in your home can give you the broad knowledge that makes people listen when you talk, enabling you to speak factually and intelligently on the widest range of subjects.

#### **Essential for Homowork**

For students, Britannica is indispensable. It is the largest and most complete reference set published in America. Its use develops the active, alert minds that bring success in school and later life.

Britannica has always been the symbol of a good home. It is a treasure house of knowledge that can open a richer, fuller, more successful life to every member of your family.

#### **Preview Booklet Offered FREE**

Simply fill in and mail the postcard today, and we will send you . . . without cost or obligation . . . a copy of our beautiful new booklet which contains an exciting preview of the latest edition of Encyclopaedia Britannica. There is no charge—not even for postage. It's yours absolutely free!

Incolorso beautifully etched it gives the illusion of a third dimension, you will see art treasures of famous museums, world landmarks, scientific wonders. Also pictured is the most magnificent scenery on the North American continent, a cruise through France, the mysterious Orient, a Pacific island, and a rocket trip to the moon.

#### Offer Limited

Just as soon as we receive your postcard, we will send your free booklet. There is no obligation, of course. However, this offer is necessarily limited, so mail the postcard today.

Clip and Mail for FREE BOOKLET

Coution: De sure le clip on detted line. Coupon becomes a FREE sell-addressed postcord – needs no stampar envelope.

# REWARD

Sure as shootin', every man who smokes the new

PHILLIES. CHEROOT

WILL GET A GENUINE REWARD IN SMOKING PLEASURE!

What's more, pardner, these



# are MIRACILE MILLID

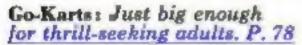
Why these cigars are as smooth and light as the sun settin' over the hills.

BUT DON'T GET CARRIED AWAY UNTIL YOU CARRY AWAY THE HANDY FRESH PACK OF 5 FOR 28 CENTS!

Slick on the draw and big as your trigger finger!

PHILIPA FRESH PACK TODAY







Breer: Will your heating plant be in hot water? P. 188



TV for '60: Better, brighter (and even on a pole). P. 72

Founded in 1872 Vol. 175 No. 6

Mechanics and Handleraft 220. U. S. PAT, OFF.

Popula	r science
December, 1959	SPECIAL FEATURES
Cover painting by Bob McCall	Go-Karts: the New Family Sport 78
	Aluminum RAT Goes Anywhere118
CARS AND DRIVING	Auto Tunnel to Pierce Alps121
If You're First on the Scene 67	Tale of Hattie the Hitchhiker127

#### Even Mercedes Has Tail Fins ..... 76 Edison's Better Battery......132 World's Hottest Hotrodder..... How a Parking Meter Works...... .138 Will the Heating Plant Last?..... Belt Drive Shifts Dutch Car...... 140

CIENCE AND INDUSTRY	PICTURE NEWS
Scope Is Man's Biggest Machine 85	Plane Goes Out the Window 70
	Now: Blow-Up Satellites? 87
we We Turning into Ciente? 114	Secretar Takes to Rough Coing 111

Are We Turning into Giants?114	Scooter Takes to Rough Going11
	Cables Keep Fields Frost-Free129
CONSUMER NEWS	Dummy Feels Low Up High136
Why the '60 TVs Work Better 72	

ney to blened it bod Sitt Hindge 11 00	AUTO UPREEP
	Hints from the Model Garage206
	Gus Keeps Santa on Schedule210

#### Editor: HOWARD ALLAWAY

They've Licked Wood Shrinkage

Assistant Managing Editors Kendall W. Goodwyn Robert P. Stevenson Senior Editors Devon Francis, Martin Mann. Everett H. Ortner Technical Editor Habert Luckett Detroit Editor Ken Fermayle West Coast Editor

Wesley S. Criswold

#### Managing Editor FRANK ROWSOME JR.

Associate Editors Erik H. Arctander, Alden F. Armagune Henry B. Comstock, Frank Dorr Sheldon M. Gallager, Ernest E. Hickman James T. Howard, Herbert O. Johannes Herbert R. Pfister, Joan Steen Ruth Westphal Editorial Assistants Ross Les Beeland (Chief)

Marie A. Brew, Anna Dallas Bebe Lipson, Roberta Marke Georgette Sparks

EDITORIAL OFFICES: 355 Lexington Ave., New York 17, N. Y.

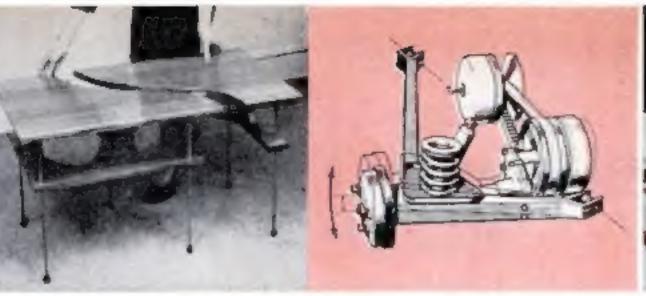
#### Art Director HOWARD C. JENSEN

Art Editors Herbert Anthony, Reginald A. Bawley Harry Samuels

Art Associates Berrrum Green, Eric A. Karminski Jr. Henry W. Kasmirowski, Richard J. Meyer Dana B. Hasmussen, Donald R. Smith

Photography W. W. Morris (Chief) Robert D. Borst, Eugene Colangelo

2 POPULAR SCIENCE DECEMBER 1959





V-Belt Drive: Step on the gas, and ratios reverse. P. 140 Fancy Shapes: Is a drill press or a table saw the best! P. 182

Table Mates: Lock them up for a coffee table. P. 222

Monthly

America's Leading New-Idea Magazine for 87 Years

FOR HOME AND SHOP	
Complete Tear-Out Booklet:	
Repairs for Electric Trains	. 99
The Forgotten Power Tool	.148
What's Your Mechanical IQ?	.153
Rose Engine with a Twist	.154
Using Scraps of Metal Tubing	.157
Tracing a Bronco and Cowpoke.	.158
The Power-Tool Arc of Safety	.161
Table for Trains or Tennis	.162
Fix-It Fife: Heating Elements	.167
Materials File: Hardware	169
Know-How File: Chain Saws	171
Adjustable Jig Cuts Circles	.176
How to Make a Snack Stacker	.179
Hearth for a Prefab Fireplace	.180
Should You Mold It or Shape It?.	
Making a Rack for Cookbooks	
Three Tables That Do Tricks	222

SHORT CUTS AND TIPS	
Fire-Safe Bucket for Storage	.156
Homemade Snow for Decoration.	160
Modifying a Saw to Cut Rubber	.165
A Spool Rack for Spare Cord	_
Winterizing Window Boxes	
Battery Charger Thaws Pipes	178
Cutting Metal Tube in a Visc	
Hunter's Underseat Heater	
Wide-Jaw Pliers from Hinges	
Hanging Heavy Objects	
EVERY MONTH	
PS Readers Talk Back	
The Month in Science	
Have You Heard?	
Detroit Report	. 62
New Ideas from the Inventors	124
I'd Like to See Them Make	

Wordless Workshop .....

Publisher EUGENE S. DUFFIELD

Advertising Manager LEE P. ADAMS

Circulation Director EUGENE WATSON

#### ADVERTISING OFFICES

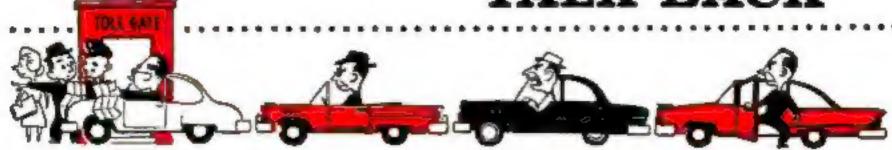
NRW YORK-355 Leaington Ave.
CHICAGO-360 North Michigan Ave.
DETROIT-2810 Book Bidg.
AAY FRANCISCO-114 Sansome St.
GLEVELAND-636 B. F. Keish Bidg.
LOS ANGELES-711 South Vermont
PORTLAND, ORE.- 520 S.W. Sixth Ave.
SUBSCRIPTION SERVICE:

Address all subscriptions and correspondence concerning them to: Popular Science Subscription Department, 355 Lexington Ave., New York 17, N. Y. Allow four weeks' notice for change of address. Please give both old and new addresses, tooleding zone numbers. Published monthly at 355 Lexington Ave., New York 17, N. Y., by Popular Science Publishing Co., Inc., Godfrey Hammond, Chairman of the Board: Eugene S. Duffield, President; Franklin E. Parker Jr., Sceretary: Eugene Raison, Vice-President; Robert D. Beals, Treasurer and Business Manager. Second-class postage said at New York, N. Y., and at additional mailing offices, Entered as second class matter at the Post Office Department, Canada, Printed in U.S.A.

Copyright, 1959, by Popular Science Publishing Co., Inc. All rights reserved in the United States, Great Britain, and to all the countries participating in the International Copyright Convention and Pan-American Copyright Convention, Single copy 35¢. Subscriptions to United States, its possessions, and Canada. I year \$3.40 (2 years \$6.00, 3 years \$8.00). Elsewhere, 1 year \$6.00 (2 years \$11.00. 3 years \$16.00). Send notice of undelivered copies on Form 3579 to Popular Science Monthly, 355 Legington Avenue, New York 17, N. Y.

# PS Readers

#### TALK BACK



#### **Answers to Thruway Problems**

I USE the N. Y. Thruway at least once a day and I know what you mean ["What Causes Turnpike Tie-Ups?" Sept.] when you talk of snafus caused by drivers not using all available toll booths. But this can be easily corrected by copying the system the Triborough Bridge uses during rush hours: Set up rubber pylons to make cars in all lanes disperse to toll booths evenly.

Many visiting motorists stop at the toll booths for directions, holding up cars behind them. A special booth set apart from the regular ones would take care of this.

J. J. PAGANO, Flushing, N. Y.

that turnpike tie-ups are the fault of the motorists themselves. You also clearly explained what could be done by the drivers to prevent such occurrences. Now that your readers are aware of the facts, may I suggest that other turnpike travelers be the next to find out?

Why couldn't the states distribute this kind of information at highway information centers, or at toll booths?

JAMES BOELTER, Bonduel, Wis.

#### Double Thanks

The July issue contained a fine booklet on mowers ["What to Do When Your Power Mower Conks Out"]. I was just getting around to writing to express my thanks, when lo and behold, along comes the September issue with an absorbing article. Now I can thank you, too, for "Can You Beat These High School Mechanics?" I'd like to see more articles like that.

BILL WELSH, Miamisburg, Ohio.

#### Praise from an Expert

IT HAS been particularly interesting to read your article on turbofan power plants ["Less Noise, More Push for Jets," Sept.]. It provides a complete and readily understandable description of this promising new turbine design and its place in the entire jet-propulsion engine series.

POPULAR SCIENCE deserves commendation for its consistent ability to explain and detail complex new scientific and engineering techniques and designs in a manner edifying and interesting both to the technical experts and to the nontechnical reader.

> Donald W. Douglas Jr. Douglas Aircraft Co., Inc. Santa Monica, Cal.

#### Using Furnace Oil in Cars

How does substituting furnace oil for diesel oil in the "D" models of Mercedes ["Royal Family of Cars," June] affect engine performance and life? Are there residues from the additives in the furnace oil that are harmful to nozzles or cylinder walls? What's the effect on loading fuel screens or filters?

K. M. PASTED, Minneapolis.

We repeat: Using untaxed fuel in cars is illegal. However, we hear there are no



ill effects on engines or filter systems. One man we know double-filters his furnace oil by screening it as it enters his car's tank. In many parts of the country the standard "2-D" diesel fuel is no different from No. 2 fuel oil.

#### Junior Rocketeer Blasts Off

Members of the Rocket Research and Development Society agree with every

# POPULAR SCIENCE DECEMBER 1959

CONTINUED

# FOR '60, A NEW SOUND DOMINATES THE ROAD...THE OVERWHELMING PLYMOUTH SONORAMIC COMMANDO V-8.

THE FIRST RAM INDUCTION ENGINE IN A PRODUCTION CAR! GIVES SUPERCHARGED RESULTS WITHOUT STEALING POWER... AND PUTS OUT GREATER TORQUE THAN 400 CU. IN. MILLS!

Here's authority! Chrysler Corporation's top engine men worked with test cars in the Brickyard at Indy . . . spent months with chattering electronic computers in the labs . . . and finally turned a "custom competition" dream into a production model!

Plymouth SonoRamic uses long, curving intake manifolds to provide the results of a positive displacement supercharger. The air-fuel mixture moves through the manifold tubes until the intake valve closes. This sets up a compression wave which travels back and forth at high frequency, building enormous pressure and ramming home a super charge at the optimum time.

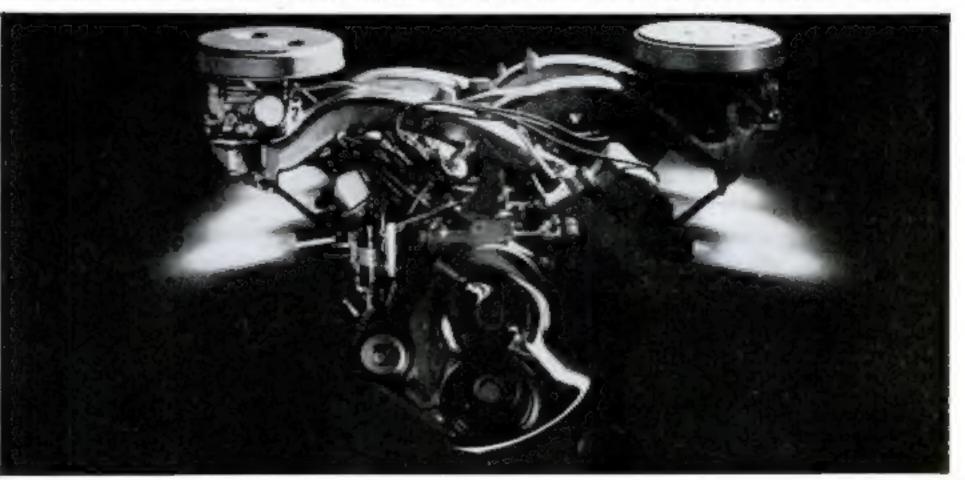
Once you hear SonoRamic you'll have to try it! You'll find it handles marvelously in the '60 Plymouth because the new welded Plymouth Unibody, with Torsion-Aire suspension, has the solid rigidity and strength high performance demands. Available (extra cost) in two versions—in ANY body model!

Note: There's more big Plymouth engine news at the other end of the scale for '60—the 30-D Economy Six, first American production car with engine stanted at a 30-degree angle. Aluminum intake manifold, many other advances. Stanting of engine lowers center of gravity, makes car easier to handle, simplifies servicing and many adjustments. An economy engine which still gives brisk performance.

A Chrysler-engineered product built a new solid way to give you solid natisfaction.

#### SOLID PLYMOUTH 1960

383 cu, in SeneRamic Commande V-8: HP., 330 at 4800 RPM, Torque, 460 lbs.-ft. at 2800 RPM, Comp. ratio, 10:1. Dual 4 bbt. carbs. Or choose the 361 cu. in. SeneRamic V-8: HP., 310 at 4800 RPM, Torque, 460 lbs.-ft. at 2800 RPM, Comp. ratio, 10:1. Dual 4 bbt. carbs.



# Learn at Home in your spare time to Fix Electric Appliances



## **Better Pay—More Opportunities**

Get into a field where there is important work and opportunity for the trained man. Millions of electric appliances are sold every year. Every wired home now has an average of 8. Many of them need service and repair. Owners pay well to have them fixed quickly, properly. This is your opportunity for a better job, your own part time or full time business. NRI can give you the training you need, at home, in your spare time.

## Spare Time Earnings Start Soon

Boon after starting you will be able to earn extra cash fixing toasters, clocks, fans, vacuum cleaners, etc., for neighbors and friends. Keep your job while learning and carning. Put spare time to work for you. Work in your basement, sarage, spare room. You'll be amazed how taslly, quickly you, too, can start earning, many extra dollars. NRI shows you how. Even before you haish training your spare time earnings may pay for the course and equipment.

#### NRI Sends Tester to Learn and Earn

You need proper equipment to service today's automatic appliances. With this course you get parts to build professional type, multi-use Appliance Tester. You learn to use it. Takes guess work out of servicing. Mail coupon for FREE book and Sample Lesson. See how easy it is to learn. Find out about NR1—a school that for more than 40

learn. Find out about NR1 a school that for more than 40 years has been training men, through home study, for success, good pay jobs. Our reputation, record, experience back up this course. Address: National Radio Institute. Dept. BN9, Washington 16, D. C.



NATIONAL	RADIO	INSTITUTE

Send me Lesson and Book Free. No Salesman will call.

Address

City Zone State ACCREDITED MEMBER NATIONAL HOME STUDY COUNCIL

POPULAR SCIENCE DECEMBER 1959

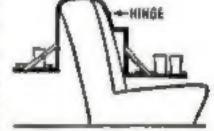
point you make on the crackdown on amateur rocket shoots ["The Month in Science," Sept.]. In the past six years we have grown from a bunch of junior-high kids tinkering with rockets to a highschool and college organization with a dedicated purpose. Although amateurs, most of us are student members of the American Rocket Society.

The ARS speaks of educational programs for juniors, though they never seemed anxious to help us obtain information on rocket-propulsion theory. All we have learned we learned by our own sweat and toil plus the individual help of a few dedicated members of the ARS. The national society seems bent on self destruction. Who will work on our missile and space program for the next 10-20 years?

WILLIAM L. R. CRUCE, Houston.

#### New Slant on a PS Project

I THOUGHT your car-seat picnic tray ["Wordless Work-shop," Sept.] was a good one. But since the seats in new cars



slant considerably, several changes make the trays more practical.

My solution might help others interested in making this project. The hinges allow the trays to collapse into a smaller package. I also tapped the holes for the machine screws in the aluminum strips so no nuts project against the seat back.

EMERY ZIMMERMAN, Portland, Ore.

"Wordless Workshop" suggests projects that the reader can adapt to his own needs. A car tray, resting on seats that vary from model to model, particularly requires individual adaptation.

#### Just Reverse the Tub?

How stupid can you get? That fellow who wants a bathtub with the drain opposite the faucets wins first prize. You take second prize for not seeing the obvious. I installed a recessed tub in my bathroom and achieved what he wants by putting the fixtures in the wall across from the drain. Simple, eh what?

C. F. WEHKING, Burlingame, Cal.

Most tubs are contoured at the drainless end so a bather can lean back for a relaxing soak, and the bottom is slightly 5 reasons why ACCOUNTING







## **MORE MONEY and SUCCESS**

SEND FOR FREE SAMPLE LESSON

REASON #1. If you were an expert accountant right now, chances are you would find yourself in one of the best paid fields of business.

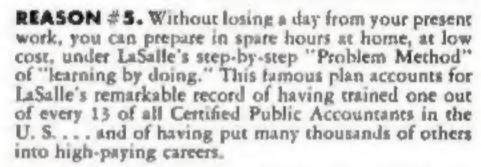
**REASON #2.** The demand for accountants is great—everywhere. All businesses must have trained accountants to cope with ever-growing requirements. It's a field offering wide opportunity—always—to the man who knows.

**REASON #3.** You can fit into any business, anywhere in the country—because accounting principles are universal. Think what this means in terms of security and independence!

REASON #4. Accounting is open to all. Any man or

woman of good intelligence, who enjoys
figure work and is willing to follow LaSaile's
systematic "problem
method" plan, can moidly qualify for a highly
profitable, enjoyable
lifetime career . . . and
he doesn't have to finish
his training before beginning to "cash in."

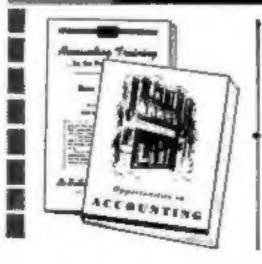
417 S. Dearborn St., CHICAGO 5, ILL.



Send today for Free Sample Lesson and "Opportunities in Accounting." Learn about the several great fields of opportunity... and LaSalle's time-tested plan for helping men and women to rapid advancement, higher income and greater prestige. The coupon below will bring this information to you—without cost or obligation.

Accredited Member, National Home Study Council

## SEND FOR FREE BOOK

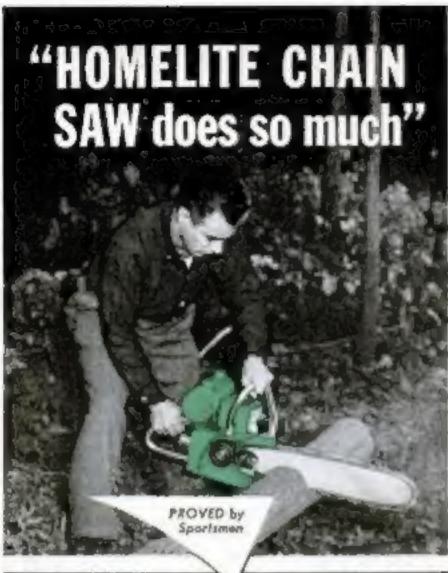


LaSal	le	Extensi	on U	nive	rsity	
					-	

Dept. 1283H 417 S. Dearborn St., Chicago 5, Ill.,
Please send me, free of all cost or obligation, free sample lesson and
your latest book, "Opportunities in Accounting."

Address.....

City, Zone, State......





COMPLETE, F.O.B. FACTORY

- . Cut trees up to 3 feet in diameter
- · Fast direct drive cuts 16" trees in 16 seconds
- Ideal for cutting wood for shelters, furniture, firewood, clearing compeltes
- . Weighs only 19 pounds, less ber and chain
- · Cuts in any position up, down, upside down

PROOF: Mr. R. Sparks, Cardwell, Missouri, writes: "I sure like my Homelite. You can do so much in such a short length of time." Have a free demonstration at your Homelite dealer's. Send 10¢ for new, informative, 16-page booklet "A Man's Guide to Chain Saws."



THINK FIRST OF QUALITY ...

THINK FIRST OF HOMELITE

sloped toward the drain so water runs off faster. The installation you suggest doesn't take care of Mr. Cronn, He wants a tub cast with the drain at the contoured end—and presumably a specially designed drain cover.

... When I remodeled our bathroom, I placed the tub fixtures so they'd be in the wall on the side of the tub, then installed the tub with the drain at the opposite end. This way, the faucets don't hit you in the back when you lean back to relax.

People often do a double take and ask if I ran out of pipe. But we find the installation much more convenient for cleaning the tub and we wouldn't go back to the old conventional position.

NORVAL SIMONSON, Seattle.

#### Word from a Poker Player

As a poker player, I must protest a statement by Devon Francis in your November issue. Says he: "The Chevy, Dart, Edsel, Ford, and Plymouth are, as a poker player would say, five of a kind."

I don't know what game Francis thinks he's playing, but his remark vividly sug-



gests a picture of him sitting around the table with his wife and a few wildly excited ladies, dealing out such monstrosities as "Spit-in-the-Ocean," "Low-Hole-Card-Is-Wild," "Baseball," and the like.

Nossir. Us poker players would call it "four of a kind, and who's the son of a bearcat who slipped that fifth one into the deck?"

JACK MACKLIN, Boston.

#### **Good Ideas Never Die**

I HATE to hear someone brag about something that was going on for years before he thought of it. That two-way ladder divided down the middle to allow one workman to go up while another comes down [Sept., p. 71], for instance. We used such a ladder over 14 years ago when

POPULAR SCIENCE DECEMBER 1959

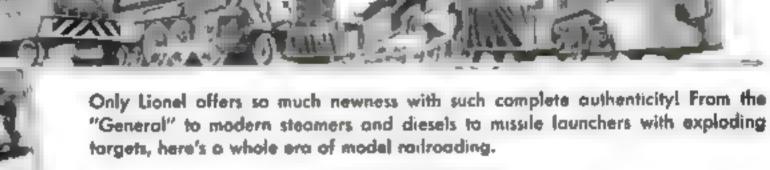
CONTINUED

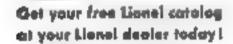
Copyrighted minimal

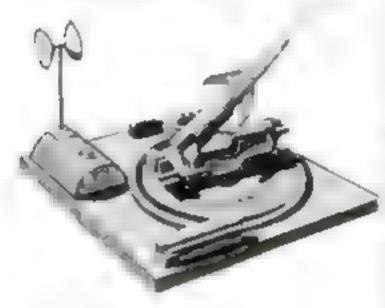
# LIONEL TRAINS

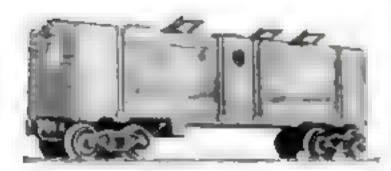
THE LEADER IN MODEL RAILROADING











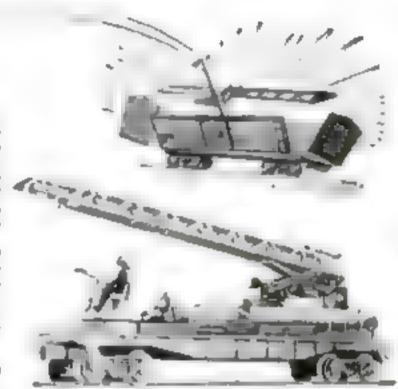
brEW1 No. 470 IIIIM Missile Leunching Plotform with Exploding Turget Cor-Prise the firing fever and the launching mechanism tilts upward. The missile fires and "explodes" the turget cur. Set includes plotform, missile, car \$10.95

NEW! No. 2512 Operating Fireman-and-Ladder Car—As train moves, fireman surveis, such negals, light retates Ladder can be extended, raised, pivated. Operator unywhere on track. \$9.95

NEW! No. 3435 Operating Aquarium Car — Within the Elizationated interior rare traplical fish appear to be evin-ming. Off-on switch an car controls the eximming action Operates anywhere an track.

\$12.95

Neith No. 3419 Operating Nelicopter Launching Cor — Wind the spring in the founding platform and set the 'capter in position. By remote control, the "whirtybird" mars into the mir, \$7.95







Lionel-designed, engineered and built...here are the best motor, drive system and freight trucks in the HO field. With every autit having its own power pack, Lionel HO offers the newest in Seconditives, rolling stock and accessories.

THE LIONEL CORPORATION, 13 EAST 26th STREET. NEW YORK 10, N. Y.



## And for smooth going with your car this winter, change to Quaker State

Quaker State winter oil is specially refined and cold-tested to flow freely at sub-zero temperatures. It gives complete, long-lasting protection to every moving engine part. Assures quick sure starts and carefree driving during the worst winter weather. Yes, Quaker State is the best winter oil your money can buy . . . Always ask for it by name—Quaker State!

QUAKER STATE OIL REFINING CORP., OIL CITY, PA.

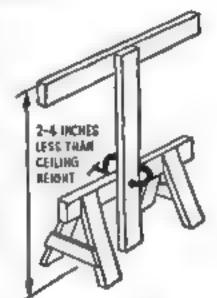
POPULAR SCIENCE DECEMBER 1959

the Austin Company of Cleveland built a General Motors division in Elyria, Ohio. That California contractor should quit boasting.

L. E. GALEROUSE, Elyria, Ohio.

#### There's Always Another Way

THE one-man platform for raising ceiling board ["Short Cuts and Tips," Sept.] reminds me of the method I used on two jobs. The equipment is simple to make and easy to use for sheets 4-by-8 feet to 4-by-12 feet.



A pair of Ts are clamped to saw-

horses and positioned below the spot where the board is to be nailed. The board is laid on the Ta, each clamp is loosened in turn and the Tee raised—pushing the board against the ceiling joists.

N. C. GARLAND, Pittsfield, Mass.

#### South Africa Looks Into Mirrors

Last spring in "New Ideas from the Inventors" [April], you showed road mirrors to reflect cross traffic. Looks like the idea might get a tryout here.

The Cape Town City Council is considering—as an experiment—a stainless-steel mirror measuring four feet by three feet. It would be fixed to a lamp pole to give motorists a view around a dangerous bland corner. First problem: What about liability in case of accident?

D. N. STEENKAMP, Lansdowne, S. A.

#### Yank Does It with Mirrors, Too

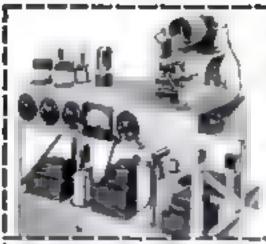
I ALREADY own a transparent mailbox ["I'd Like to See Them Make," Aug.] but it's out of sight from the windows. I still had to open the door to find out if I had any mail. To get around this, I've added another improvement: a mirror on my porch that reflects the mailbox when I peer out through a front window. Now I'm all set for any weather; let it rain, let it snow!

L. N. PRITCHARD, Grand Rapids.

#### Split-Level Bench Makes a Hit

WARM congratulations on your splitlevel workbench complete with blueprint [Sept.]. I was so taken with it that I

CONTINUED



#### YOU BUILD Broadcasting Transmitter

As part of N R.L Communientions Course you build this low power Transmitter; the et to learn methods required of commercial broadcasting experience, conduct tests to Obetalors, Irain for FCC

license.

#### YOU BUILD Signal Generator

NRI sends kits of parts to build this Sumal Generator You get practical

compensate Radio (requency amplifiers, practice align og a typical I F video ampliher in TV circuit, many other experiments.



#### YOU BUILD Vacuum Tube Voltmeter

Use it to get practical experience, earn extra cash fixing neighbors' sets in spare time, gain knowledge to help you work in Radio, Television, Color TV With N.R.I. training you work on circuits common to both Rarlio and TV. Equipment you build 'brings to life" things you learn in NRI's easy to-understand lessons 64 page Cotalog FREE, shows al equipment you get.



#### YOU BUILD AC-DC Superhet Receiver

NRI servicing training supplies all parts, everyth ng is yours to keep Nothing takes the place of practical experience. You get actual servicing experience by practicing with this modern receiver, you learn-by-doing.





# earn RADIO 1111/E 4 1 1 1 1 1

by Practicing at Home

NEED FOR TECHNICIANS INCREASING

#### WHAT GRADUATES DO AND SAY

#### Chief Engineer

"I am Chief Engineer of Sation KGCU in Manuar N D | also have my own spare time. bus more servicing high frequency two-way comfouriral and systems R BARNETT BImarck, North Dahota.



#### Faid for instruments

'I am doing very well in spare time TV and Radio Somet mes have three TV jobs waiting and also fix car Radios. for garages. I paid for instruments out of earnmes." G F SEAMAN, New York, N Y



"We have an appliance store with our Radio and TV servicing, and grt TV repairs. During my Army service. NRI training helped get me a top rated job. W M WEIDNER, Fairfax, South Dalmita.







#### Fast Growing Field Offers Good Pay, Bright Future Today a OPPORTUNITY field is Radio-Televi-

tion. Over 1.3 redion home Racios plus 30 million sets in cars and 40 000 000 Television. sets mean big money for trained Radio-TV Technicians, More than 4 000 Radio and TV Broadcasting stations offer interesting and the portant positions for technicians operators, clor television portable TV sels. Histi, other developments assure (uture growth,

It is the trained man who cets ahead. The fellow who saes his spare time to develop knowledge and skill gets the better job drives a better car lives. in a better home, is respected for what he knows

and can do. So plan now to get into Radio-TV Keep your job while training with N R I You

learn at home in your spare time NR1 is object and largest home study Russio-TV School. Our methods have proved successful for more than 40 years, provide practical expenence

Soon after corp., ng. many N R I students start to earn \$10. \$.5 a week extra in spare time fixing sets. Many open their own full time Racco-TV shops after getting N.R.I. Diploma. Find out more, Mail Coupon, Cost is low, terms easy includes all equipment Address Notional Radio Justituto, Dept. 1988, Washington 16, D.C.

Send for LESSON and CATALOG

-co G.L. Bille



## NATIONAL RADIO INSTITUTE

Dept. 9HB, Weshington 16, D. C. Mail me Sample Lesson and 64-Page Catalog. FREE (No Salesman will call. Please write plainly.)

Zone- State-ACCREDITED MEMBER, NATIONAL HOME STUDY COUNCIL



had to make one right away. After finishing the pull-out table, I set to work on the bench and found one small error in your figures.

At the right side, a 28" rail is specified; at the rear, a rail 48" long. Now then: When the side rail is notched into the leg, the rear rail is too long. The back of the bench-shelf frame picks up

length the same way.

But this is a very minor thing, so carry on with the good work and let us have more blueprint projects like this.

REG TOWLER, Pine Falls, Man.

You're right, of course. The bench rail should be 48" minus the 15%" thickness of the abutting side member, or 463%". And the back of the bench-shelf frame should be reduced by 3/4" to make it 471/4".

#### Under a Spreading Chestnut Tree . . .

VERY few jobs need a lathe despite the complaints of your reader [Aug.] who has only an electric hand drill to make small holes in bolts and other metal. All you need is a little old-time blacksmith know-how, plus a center punch and a heavy hammer.



Some years ago I made a simple but stable X frame for drilling jobs. It's just a piece of angle iron (any size or length will do) and some strap iron the same length and a little wider, clamped and welded.

With this setup, drilling pipe or rod is a cinch.

ED CURTIN, Pleasant Plains, Ill.

#### The Short and Primitive Tuatara

You ask "Do 'Extinct' Animals Still Survive?" [Sept.]. I don't know, but I do know that the illustration at the top of the article is not a Komodo Dragon but a Tuatara.

The Tuatara is the sole surviving member of a primitive order (Rhynchocephalia) of reptiles. While the Komodo Dragon may reach a length of over 10 feet, the Tuatara is doing good if it makes  $2\frac{1}{2}$  feet.

JAKE LATHROP, Waco, Tex.

Church best find three 454 delivery charge by enclosing WITH rescent to envelope entire payment of \$7.56 for Auto Manual, or 52 for Track, Manual o Same return-releast privilege

Print Number.



A STATE OF THE PARTY OF THE PAR

Build and beep this B.G.

Davey Engineered TV get-

Deviry offers mother home

You build and hosp this 5-inch COLOR OSCILLOSCOPE — almost as "must" for TV purclaing.

COLOR

DaYry Took's

program aiso

includes training In Color Television

stelling, operating, servicing. Equally important is the fact that these are 6000 JOBS—affering the kind of a future that an untrained man aften drawns about.

> No previous technical experionce or advanced education needed. Prepare for this profitable field in your spare time of home, or in our modern Chicago er Toronto Laboratories. Nothing else like it! Soud for FREE details.

#### EARN WHILE YOU LEARN

After you get men of DeVry Tock's training with equipment of home, new may then in your spare time, o to deero real maney servicing die and Tolovicion sets.

#### IOME MOVIES . . .

could important points ayalaf ur, Speade your lastying, We of the baring un historias at year side?

#### MILITARY SERVICE

W you are subject to differen service, the information we here should prove ? helpful. Mail groupes to



#### Your GUIDE

## to Profitable Job Opportunities

TV-Radio Broadcast Technician Color Television Specialist

Radar Operator 💌 Laboratory Technician Airline Radio Man 

Computer Specialist

Quality Control Manager

Your Own Sales & Service Shop ... PLUS MANY OTHERS

#### YOU GET EMPLOYMENT SERVICE THE SAME

that has helped thousands of our graduates toward fine careers in Electronics.

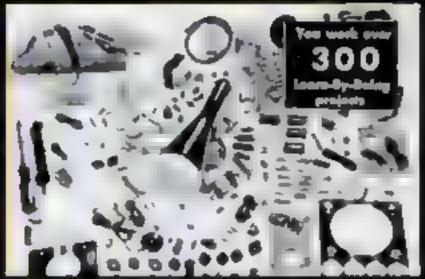
#### Send for FREE BOOKLET TODAY!

"One of North America's Forement Electronics Training Conters"



#### DeVRY TECHNICAL

Formerly Deforact's Training, Inc. CHICAGO 41, ILLINOIS



pair parts. You build and operate virtiets mitrophese . . , and many of designed to provide autolouding

### NOW!

Oct Information pocked publication FEES:

DAVRY TECHNICAL INSTITUTE

4141 Belmont Ave., Chicago 41, III., Dept. PS-12-P.

Plague give me your FREE booklet, "Electronics and YOU," and tell me haw I may propore to enter one or more branches of

-		Age
ireal	PLEASE PRINT	Apt.
By	Zono State	
D44 C	m residents address DeVry Tack of Cored 826 Resalows Ave Teresto 12 Ostaria	a, List.

## READY FOR THE SPACE and SCIENCE ERA! SEE SATELLITES, MOON ROCKETS



See the Stars, Moon, Planets Close Up! 3" ASTRONOMICAL REFLECTING TELESCOPE

60 to 180 Power-Famous Mt. Palemar Type' An Unusual Buyl

Assembled-Ready to use! You'll see the Rings of Saturn, the factinating planet Mars, huge craters on the Moon, Star Clusters, Moons of Jupiter in detail Galaxiest Equatorial mount with lock on both aver Asuminised and over-coated 3" diameter high-speed f/10 mirror. Telescope comes equipped with a 60% ereplece and a mounted Baylow Lena, giving you 60 to 180 poet. Leta cost accountry evention evallable for Transcope always so essential, is

Valuable STAR CHART plus 212 page "HANDROOK OF HEAL END" pure "HOW TO ENE YOUR TELEBROOF HOOK

Block No. 85.050-N ...

PERSONAL ADMINISTRA

KNOW THE TRUTH ABOUT POWER Talescape on authorist Telescape will only give you pract to powers to about 50 or 80 times per tich of objective d ameter powers to are above the billy produce empty magnification—make youring dom, difficult and unsettalectory

#### 41/4" ASTRONOMICAL TELESCOPEL

UP TO



With this accide you can are exceptly be As above but with greater power plus will split finer state. Mirror has twice the light fathering power. Mirror awaranteed to a ver the state at his a of re obtaine toget which which is made to the history out to just real equatorial assuming only one a Dissertment for some place & unitroduction to a some Super Colerence 2 dunct and each erro towers and mounted that on

and 2. A f period of Refferentiable for halo possess First with Scope — Valual of Refferentiable for halo period RODE OF HE ILEAN Philadelphia To the hold Refference weight 25 No. Stock Mo. 85.000 M \_ \$74.30 for h.

Same Telescope as above but equipped with Electric Clock Drive— Stook No. 45,084-M \$114.60 forb. Recritiques, N. J.



P-PIECE DRAWING-COMPUTING SET

Stuck No. 70,242 N

33 00 Postgald

#### Take Telephoto Shots Thru 7×50 MONOCULAR

The to the quality American made in extrament were early us to the proof of the food of a 10° lines or the effort which of a 10° lines or the effort which are as the effort which are as the effort of the effort o

Stock Na. 50 003 N

. \$15.00 Portpald



NEW! STATIC ELECTRICITY GENERATOR

For a tipe of a happy as you set of a min state

Set a thri be state than ay as you set of a min state

to be said to be read a mile and two of pix to do see reate

the prost of the tent on Metal cut sector brushes ratch up
the state a new ready a size it to the learner ar type con
thenser. I debuted by the unit of seek in the per

ker annivelous ments 24 page instruction booklei me used

stock No. 70 OYD-N Block No. 70 970-N \$12 95 Postpaid



#### 50-150-300 POWER MICROSCOPE

Amazing Value Equal of a \$75.00 instrument! I Achenmatic Objective Lenses on Revolving Turrent imported! The conferenced emission achenmatic to the interest of the object of the property of the object of the obje

#### MOUNTED 500 POWER OBJECTIVE

Threaded for easy attachment in above micro-nomic termina cover in the rice of 3 days freal leads Stock 230 (97-9) 25 00 Perod.

#### SPECIAL! SPECIAL! Terrific Buy! American Made! OPAQUE PROJECTOR

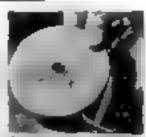


" rets illustrations up to \$" x 31/4" and .. g s them to 4 ft. wide. No film or negas seeded. Projects charle, diagrams. ct res photos, lettering in full color or a white Operates on 115 voit, A C 5.54 6 ft extension cord and plug in-Operates on 80 watt bulb not in 81ze 12" x 8" x 4 - " wide. Weight . ... Plastic case with built-in han't e

Stock No. 70,199-M

#### NEWI CIRCULAR SLIDE RULEI

Be a Math Whiz' New Circular Slide Rule multiplies, divides, figures fractions percentages, squares, cubes, roots, proprices, fuel consumption. Eliminates the confusions of ordinary allde-rules. Pricefar lower, Faster, easier to learn and the Constructed of 2 aluminum discs will tor 31-2 diameter. Directions included Stock No. 30,336 N



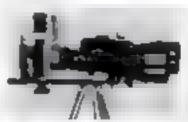
\$4.66 postomed

#### "EASY-CARRY" SLIDE PROJECTOR

ideal for travel or occasional use PROJECT and Minor for regard or operational take in collect with the state of children in the collection of the state of children in the collection of \$22 65 portpaid

Stock No. 79.232 N

#### NEW BINOCULAR-TO-CAMERA HOLDER



For Engiting Tolophia.

Being distant. Justs 7 these measure with a 35 min may so 7 and 1 min as and one Sy will be 1 124th TO-C antition for the distance of the property of the camera and businesses of their least any camera at 1 or movie Take coor or black and white Fuel directions for taking told pictors May 270, 271, M. Hit 40 Bandania. Stock No. 70,223-N ... Bif.60 Postpald

FISH' WITH A MAGNET

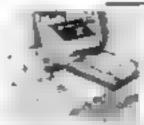
Go Treasure Hunting On The Bottom -

Great id a Facementing fun and annett sea to the of the factories of the state of the factories of the 88.60 Parigaid

Bleck No 70,285 N. 5 lb. Magnet 152 lb and W 107 or 250 mm Stock No. 88,088 N 18% Ib. size.

\$22.80 F 0 B. Parriagton N J

STREET



Sa pping we get 22 its

Play This New Game-MATH MAGIC . . . The Fun-Way to Math Bkill!

beingstor approved 3 use not be comes in one! (1, var. 1) for a new amore increasing as I at a let trop, substantially and the electron, divisions for a result of Carrier Inc. n.es. Pall are Spot r Namber of Cards Block No. 70,204-M. ...... \$3.00 Postpaid

#### FREE CATALOG-N

128 Pagest over 1000 Bargainel

America a No. 1 source of supply for experimentary, hobbyists. Complete time of Astronomical Telescope parts and assembled Telescope. Also huge selection of leases, prisms, war surplus optical instruments. parts and accessories. Telescopes, microscopes, satellite scopes, binoculars, infrared shiperscopes, science experiment items, much learning and teaching aids.



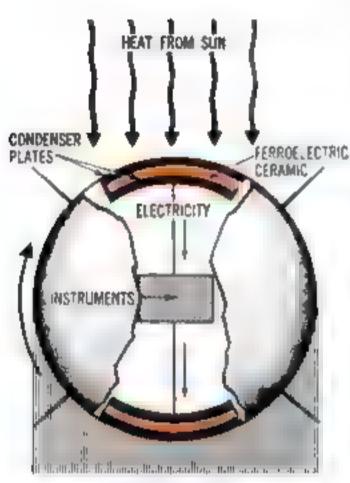
REQUEST CATALOG-N

DREER BY STOCK HUMBER . . . SEND CHECK OR MONET DROVE THE SATISFACTION GUARANTEED!

BARRINGTON, NEW

## The month in science

Making electricity with a pump. Space vehicles' strange demands for electricity have sent engineers rummaging through the textbooks for trick methods of generating power. Satellites use a lot of juice (some will require 2,000 watts' average). They need it for a long time, several years preferably. The sun can provide all the energy—as heat and light—for as long as necessary. But you have to change the sun's energy into electricity-without loading down the satellite with converting gadgets.



COOLING IN SHADE

The newest way to do that uses a sort of condenser. When heated and cooled repeatedly, it pumps electricity around a circuit. It gets heated when it points toward the sun, cooled when rotation of the satellite puts it in the shade. International Telephone & Telegraph is working on it.

> The system is called ferroelectric conversion. It depends on the way some ceramics (similar to the ones in hi-fi pickups) change their ability to store electricity as the temperature changes. A condenser made with such a ceramic between its plates can hold the most charge at one specific temperature (called the Curie temperature). At higher or lower temperatures, its capacity is a great deal less.

> To make this fact of nature change heat into electricity, you start out with the condenser at the Curie temperature and fully charged (from a battery). Then you heat the condenser some more by pointing it at the sun. The increase in temperature de-

creases its capacity, and electricity gets squeezed out. Next you cool the condenser (by turning it away from the sun). When its temperature falls to the Curie point, the capacity jumps and electricity flows in again.

If you keep this heating-cooling cycle going, the condenser repeatedly pushes current into the wires and pulls current back from the wires-just like an alternating-current dynamo. One possible scheme for installing ferroelectric converters on a satellite is shown in the sketch: Two groups of converters, on opposite sides of the spinning satellite, would pump juice back and forth between them, one pushing electricity out when the other pulled electricity in.

This is one space development that does not look very exciting for portable radios and such earthbound gadgetry. The converter's efficiency-comparing heat used to electricity produced-is pretty bad. The space men don't have to worry about that; the sun's heat goes to waste anyway. What they like is the ferroelectric converter's high power-to-weight ratio. One pound of the things should give 90 watts, more than double the output from a

### The month in science

pound of the sunlight-to-electricity cells now being used to power satellite gear.

Metal you can see through. The molecule mechanics at General Electric are inching toward that old dream, a transparent material with the strength of metal. They have made a new type of ceramic, Lucalox, that is translucent and extremely tough.

Lucalox is made by pressing aluminum-oxide powder and firing



Luculox rod here outlasts quartz in a blow-torch test.

the pressed shape at unusually high temperatures. The result is a metal-like ceramic, its individual oxide crystals bonded directly to one another, just as crystals are in a metal. The crystal structure is what makes the difference. Other ceramics either have glass bonding the crystals (porcelains), weakening their structure, or have pores between crystals (oxide ceramics), making them opaque.

Lucalox is more like rubies and sapphires, which are large single crystals of aluminum oxide—tough and transparent, but very difficult to make the size and shape you want.

Lucalox is still far from the material for transparent car roofs or house walls. Its first use will be in military and industrial devices requiring windows that stand up against tremendous heat (it's better than rubies and sapphires for that). It may also make more powerful lamps. Lucalox can take twice the heat that fused-quartz bulbs can.

Asking for murder. A lot of people get themselves knocked off by coming right out and asking to be killed. Dr. Marvin E. Wolfgang of the University of Pennsylvania checked 588 murder cases in Philadelphia, found that the victim was obviously responsible in 150 of them (more than one-fourth the total). Typical case:

A man came home drunk and started to slap his wife around. She said: "You hit me again and I'll kill you."

He handed her a butcher knife, looked her straight in the eye, and slapped her again.

So she killed him.

The psychologists have an explanation for this, naturally. Dr. Wolfgang describes it as a form of suicide: a deliberate desire of the victim to be punished for his wrongdoing. Some non-psychologists might tag it simply as a bluff that got called.



This Big Processed Break gross full strictles on it marking diagrams obligation in It marking diagrams during the plans plats into the state of the plans plats into the state of the light and the state of PCB 1875, Macke and Input.

Birsel Engrees, Hydrometic and Florid Streets Fully Suplained.

A complete gode at 1890 Pages. them no no de the wron of marking parts, with material ?



Completely up to the measure Printed at male 46. ENCLE No. 1 IN COUPON

#### HOME APPLIANCES

2001A45u B110 PASSING ST

10AT 1885 B0 1001

BANGES

PROTEIN

other GAS AND ELECTRIC APPLIANTS Hands Riference for the in & Go Serie seems. M. han . Dies in out 16 mg tweets to any learn and some a how to pengin are a set here is rest are as his and decreased to my diagrams. Of Fig. a Engi-ter read Assessors Add. our questions, \$66. Pages 17as ared in \$8.

CHICKS No 3 IN COUPON



#### TV TELLS NOW TO AMSWER BARRO EV. QUESTIONS SERVICE LIBRARY

Dend to Lard to believe tops De A makes France For early A DE Total total for major DEPost books and a tracers

TWO COMPLETE VALUED Congrams on massings Fu TRANCST BS & T Ė A Cranger By stores Ph. mog age P. 2 M Awn Bada Short Wave

Ban p n p n c n C n repe en (a c reper to the reper to th Includes the High P speed Qui t man stands name Only 26 for

CHICLE No 2 IN COUPON

#### NOW YOUR TRUCK

The TREEK & TRACT B G IDE for Mr Lovie & Drass, Formers, Goragorina, Helpers, Owners, T. sable Bhoustop Figures at: C veries Gas & Desirt Monte Prinhapter direction of Constitutions of the Constitution of Constitution

Migable nance Mejour Braton Bres. he of all Party 176 Pages PLLLY ELLUSTRATED Sades (Mily 15

CHICLE No. 5 Nr. COMPON



# TTERS GUIDES



Process Trade America & Write some Set Repaired to global longuage and by these climited one chapters charts graphs and printed the printed states of modern planshing profittion as white P pr F they and A. Conditioning it Vata. Phys Paper a 1401 Diagrams is Restaurante Only 15 in the complete at all 4 vols. CHICLE No 4 IN COUPON

#### PAINTING & DECORATING MANUAL

People Triple information on metalic and receive truck from to the a part a proper store of teachers paper from the floaties truck symbotic papers reduct to the store for spray requirement cutts, atomicing on A COMPLETE guide is successfully painting and decorating 466 Pages. July Mostrobed Only 52. CIRCLE No. 7 No COUPON

#### EXAMINATI FREE DAY

REND NO MONEY For the pr gind to held you say of the Aude? Confee to atmirtely Fire E paperingsom in your you have. We take all the risks and have all the decrease up to VOC. There is no old ga-tion. It pay decide to keep the backs of their their two may them under our orientable root pay plan of other Let.

#### HERE IS ALL YOU DO

TTE EASY TO OHOUR In the Halling Man Order Changes at the right past draw a circle orband the parties of Jude Quides you dear as to loted you for PPEE EXAMINATION We sell mad there in you at one to Bully you build a brighter future by its making to BECLE. If for any return of all you are not COMPLETE. I have been been return the books to us, and that will and the matter? MP STRINGS OR CATCHES TO THIS OFFER.

THEO. AUDEL & CO. 49 West 23rd Street, New York 18, 9L T.

# JILDERS GUIDES



PRACTICAL STOREHOLSE OF ME THE CONSTRUCTS OF THE FOREST ON THE THE FOREST OF THE PROPERTY OF T

h is no row because and be pro-fore. Surregion to the plea place of the total of the control of themselves the NEW EST intermental on the NEW EST intermental Wall a Truck treat upware into the 2 ting process farm-time ato. Val 2 till to me to the a degree of place upon features, estimates are Val 1 fill the and roof tenning. his highest foundations are Yo. 4. Down and on an are by iding me though some agent discuss 1964 Pages 1700 Historyaham. While pripare 54.

CHICLE No. 8 IN COUPON

#### PRACTICAL ELECTRICITY

A COMPLETE HAND BOOK On the employed weeds not not on made great a communication of the folias and leaves a Majoritecture of Majoritecture of

CIRCLE No. 4 WI COUPOR

THERE S TO BY WIRD T M 16 PM ISSEE 1981 S Ball to See 198 See LAGINER descript that and of shim constances had Pages Puls 1 in shift Provid \$1. CHECK by 9 M COUPON

WELDERS GUIDE Stony Bank Our street menting f. h. or a spin gold or provided to the second of the mount of the second of the mention of the spin to the second of the second CIRCLE No. 18 HE COUPON

#### MATHEMATICS MADE EASY



A CHIPLETE NOME STUDY COURSEage and not being the Magra of and ele tr 641 at he the markety 1s

chains plane and is a grown of a grown on algebra at rains, one Prop. in is a colo one white and data blow is one able take "S. Paget 950. waterston. Proced at only \$5. CIRCLE No. 11 JA COUPON



MI JERY MACHINE SHOP PRACTICE S PRACTICAL BUNDES W 1792 Man both open to June Tells been to art up and operate to been present and milling approximate STATE SHATES CTOP AND HAPPENICE BOOK 1738
Pages Folg I introded Pried of only \$8

CHECKS No. 12 MI COUPON

#### WIRING DIAGRAMS

That hash price the provided facts on a ring of sheep on a reservoir. It regimes risers and \$1MPLY here to use apparatus for all finite of the receipt Rack displace is runs plets and actionships Know your MOOK UPS 364 Pages Chaptered Only \$2

CHICLE No. 15 IN COMPON

#### REFRIGERATION & CONDITIONING



GPED MINE of spacety information.
Completely up to date: 1168 Pages, Fully Shouldered and
Ladered, Proper of only 56

CHICLE No. 14 IN COUPON

THEO, AUDIN & CO. —Salf Improvement Publishers Simp 1977 —

a COMPLETE ENCYCLOPEDIA repuising in simpleys forms the fundamental graticality, rates and apations of applied electronics

A COMPLETE COLLEGE INVESTIGATION !

Fully illustrated with diagrams and absorber, calculations and tables for reads not reads. Questions and growers. Tradhave not practice study and orners. All board on the most madern theory.

Vol. 1 Procesples and roles of the cree to magnetistus, action types repeats. No. 3 |

Vol. 2 Dynamon, DC \$6-tors, construction, envision rops regularization for Ptp. 18

Vol. 2- Testing interpretation and texts, stategy bette a concer and repairs. No. 17

Val. 0 - Alternating current paper in tax: alternations, transferences No. 15

Vol. 5. A.C. Motors work maken have be by a

tention, plane, ends, std. N= 11

Vol. 8. Bartenge, signalit. pleasure spenson atc Ma 23 Vot 9 Badto, telephone, parties the 21

Vat 10 Beleggregann, illig-mention in lding vices, ele vice application, lager. No et

7 000 fully districted pages. Princed at using \$30 for Pap. 1917-191 SET About spill stell-valuestry for \$2 analy



#### ALL TYPES OF BLUEPRINT READI

How to read peaks, the shoulded a reliable detail and assess The second secon at a first Pos

24.25 M Pr .



produces page total in the age is in the figure and in using encount points. In it would be used in using the days being the part Well. In the property of the pro CHICLE No. 36 IN COUPON



#### ELECTRIC MOTORS

THES GUIDS overes the consequences bookups no of transcription and translations
on of all payed restore to toke pressure
winding Explaints on in tokes to got the
tip in simple inequage O- 056 Pages of
minrovacion 817 Chag area All pro of metars tally discussed
and indeped the ready sciences. Freed at only 48.

CHICLE No. 27 MI COUPON

More recognite explaining as detail both domestic and indu-ria in ferritor 25-budes after the at hand upo and arring thegenus. Fully as may the theory ran-show the moralla on expectant history, area ing that a part of the party of the detect for tracky collection. Over 41th Pages 126 Phosphythese and Degrades, Only 12





12 00

#### ADDITIONAL IMPORTANT

The Inthonesia Austr Greeter are at the test on here firther on an increase to reply to them all became a Best to Create the marking mental or the MATE OF FR. (CPCSM polyment testing are are to FMRE SEARCH NATIONS DESIGN TO THE METAL WORLD'S MATERIAL SEARCH NATIONS AND SMET METAL WORLD'S MARKET SOCIETY OF THE SEARCH SEARCH

No. 30 SMEET META) WORKERS NAMED BOOK AND Pages
No. 10 MECHANICA, DEARWING OMING 197 Pages
No. 21 ME HAN CAL DRAWING AND DESIGN
AND Pages
No. 24 CLI TR ANY FLAM-NAT DISC 777 Pages
No. 24 CLI TR ANY FLAM-NAT DISC 777 Pages
No. 25 CLI TRIC POINTS FLAM-NAT DISC 7400 AND
No. 26 CLI TRIC DISC PARAT GOOD Terms
No. 26 CLI TRIC DISC DISCART COMMITTED AND PAGE
NO. 26 CLI TRIC DISCART FOR TAXABLE SANT PAGE
NO. 26 CLI TRIC DISCART FOR TAXABLE SANT PAGE
NO. 26 CLI TRIC DISCART STEAMS SANT PAGE
NO. 26 DEPART NO. 1965 NICK STEAMS SANT PAGE
NO. 26 PAGES
NO. 27 PAGES
NO. 28 NO.

312 1 2 1 4

THE ST ASSESSMENT CONTRACTOR OF THE P. P. P.					
Phone must me for T days' PRES EXAMINATION the South T form clothed or right.	P.		•	70	99
I agree to mail \$2 or 7 does no such book or set ordered and to inches this \$2 a month in one's look or are indiced usual I have paid the purchase price, plus singuing roots, \$1.2 am not completely initialist with my Anial Confee 2 may return them.	12	13	16	19	10
	17	10	19	30	21
NAME	22	13	14	25	24
ADDRESS	37	ņn.	100	- 80	Tri.
OCCUPATION.	32	33	30	25	36
SAVE SHIPPING COSTST Clock have if you endow complete pay-	10	00	20	44	40



Operation pop bottle: The Coast Guard is appealing for help in classic shipwreck style. It's tossing bottles with notes in them into the sea. No, the Guard's not floundering; the bottles are just part of a study of the speed and direction of ocean currents.

Each bottle has two notes in it. One requests the finder to break the bottle—so he can read the other note. This is a prepaid form explaining the mission and asking the finder to list the date and location of the bottle when he picked it up.

The Coast Guard expects to drop 2,000 of the plain pop bottles at distances from 10 to 35 miles off the coast between New York and Boston. Officials hope a large percentage will be returned, although they expect some bottles to wend their way through the Gulf Stream and wash ashore in Europe.

As an incentive to the finder, the Coast Guard promises to tell him where the bottle was originally dumped. And if he's been nimble-fingered enough not to have had to break the bottle, he gets to keep that, too.



Parking place for two: Parking meters are currently installed at 22-foot intervals. The American Automobile Association suggests pairing them in 18-

foot spaces and leaving an eight-foot oasis between. This would remain open for maneuvering to make parking faster, safer, and easier.

Auto theft a major crime: The FBI's annual "Crime Index" lists auto theft as one of the seven major crimes in the United States. The latest figures (for 1958) show increases in every category of serious crime, with the total number of offenses disturbingly near 10 percent higher than 1957. During the same period, population rose only 1.7 percent.

Auto theft appears on the list for two

C		Offenses	Percent
Crime	1957	1958	increase
Murder	8 027	8.182	19
Forcible rape	12,886	14 561	13 0
Robbery	66,843	75,347	127
Aggravated assault	110 672	113,530	26
Burglary	603,707	679,787	126
Larceny over \$50	354 972	391,550	103
Auto theff	265,178	270 965	2.2
Tota	1 422 285	1 553 922	9.3

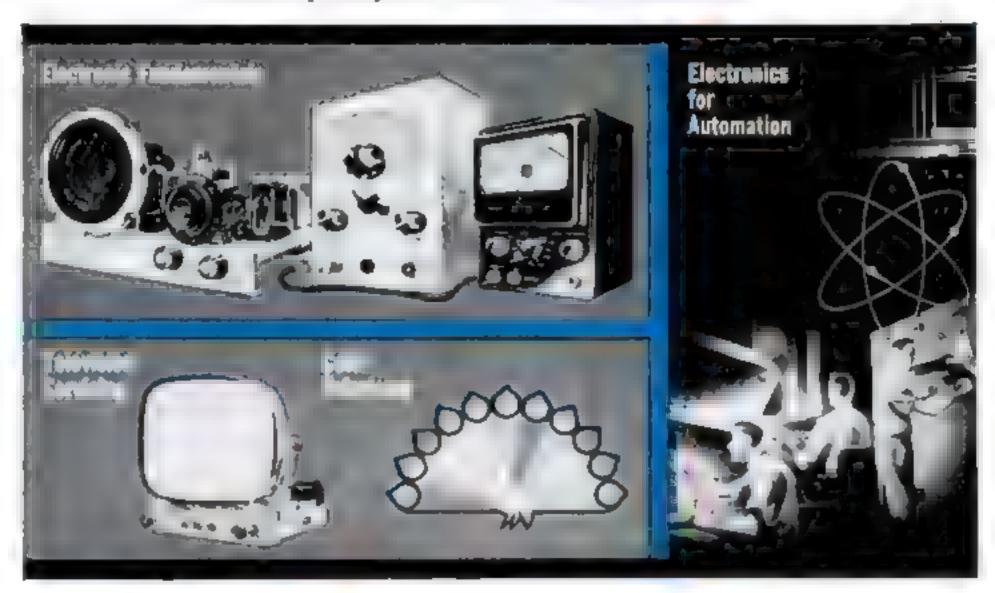


# LET RCA TRAIN YOU IN ELECTROMICS

RCA Institutes celebrates Fifty Years of Electronic Training by introducing its newest Home Study Course ...

#### ELECTRONICS FOR AUTOMATION

... Now you have four comprehensive courses for your electronic training . . . from basic electronic theory to the more advanced principles of color TV and Automation.



Send for our 64 page Home Study Catalog FREE RESIDENT SCHOOL offers Technical lastitute and Youthead School Courses in Electronics Day and Evening classes start 4 hours each year. Remiest School Cata ing ment (ren em renpest. ANOTHER WAY REA SERVES ED. UCATION THROUGH ELECTRONICS Practical work with the very first lesson, Pay-us-you-learn. You need pay for only one study group at a time.

RCA	INSTITUTES, Inc., Home Study School, Dept. PS-129
	A Remove of Studen Community on all America

350 West Fourth Street, New York 14, N. Y.

reference will call.

Hama	Ple	ese print		
Address				
City		Zone	Storie	

Karson Yetzi Enter Discharge Date

CANADIANS — Take advantage of these some RCA courses at no additional cost. No postage, no customs, no delay. Sand coupen to: RCA Victor Company, Ltd., 5001 Cote de Liesse Rd. Montreal 9, Quebec In same time, posts soupon on postered

# Innt be half-trained CHOOSE YOUR CAREER



# MAKE MORE MON

A Successful Career ... Security ... Are Yours NOW in Medern Industry?

Every one of the "Big 3" industries...TV-RABIG-RECPRONICS...AUTO MECHANICS AND DIESEL...AM CONDITIONING-REFRIGERATION-ELECTRICAL APPLI-ANCIS, , , each is growing at a transmisus pass. Life

Right new is the heat time for you to get into the industry of your shokel You can be a part of its: growth, a year out introute your earning power and you can really holld a Successful, Secure Future, filled with all the good things life has to offertil Send for information HOW...TOBAY. We'll give you all the facts by mail. There is no abligation on your part...nor will you be inconvenienced...as NO SALESMAN WILL CALL ON TOUTE - 🔻 🧸 🧠

 N.T.S. TRAINS YOU RIGHT, FAST AND EAST! incomplete "short-out" training limits your earning penser, event diagonishes you for expense jobs. M.T.S. gives you training in All Phases....to qualify you for any job in your field...for greater profits all year Pround t - . . . .

> YOUR N.Y.S. TRAINING IS BETTER. MORE COMPLETE, LOWER COSTI

\$9778K...proved and tosted in M.T.S. Resident School Shops and Laboratories, by the CLDEST and LARGEST School of its kind in the world. Established in TVIIA.

MORE COMPLETE, you loarn All Phases, and you receive EVERYTHING YOU NEED-Lessons, Manuals, Diagrams, many big Professional Kits with parts, teels, instruments for your experimental, repair, parvice, and trouble-sheeting projects. You also receive many valuable training "Extract" to accura 

LOWER COST... other schools make several recrees out of the muterial in each one of our MASTER COURSES... and charge you more for feet training than you get in may one of our "Big 2" at DNE 

#### - \*\* FARN AS YOU LEARN

We'll show you how you can earn money right from lite start. Many students pay for their sources-and tars much more—while studying. So one you!

RESIDENT TRAINING AT LOS ANGELES I you such to take your training on Resident School of Lot Angelet start NOW in our pie modern Shops and cabe Here you work with usteal equipment professionally natalised finant most complete faculties offgred by any achoos Lipari freendly entires tars Personal attention Graduate &c. stany Service Help in finding home and part time jub while Lan justil Cydey pay in cambou jos tult information.



4401 10. (010) 100 St.,-IN ANDRES IS AND U.S.A.

VISORY DOLLHORS

YOU ARE NEEDED IN All Photos of TELEVISION RADIO-ELECTRONICS ... Servicing, Communications, Broadcast no. Manufacturing, Automotion, Radar and Micre Wayss, Missile and Rocket Projects, plus all the other high-pay branches of this vigorous Industry N.T.S. Shop Tested Mame Training gives you ONE MASTER COURSE , at ONE to train you for these unknoted apportunities including many technical jobs leading to super-

YOU BUILD MANY EXPERIMENTAL AND TEST UNITS WITH KITS AND PARTS WE SEND YOU -you odvonce tiep by step, perform more than 100 experiments, and you build a complete modern circuit TV set from the ground up! The set is yours to keep including the big new TV picture tube we send you at no extra charge. You also gord and keep a sweet Warm Long Wave Superhet Receiver in odd tran, you receive a valuable Mult tester. for your report service and traub a shooting job projects. UP-TO-DATE, PRACTICAL LESSONS AND INSTRUCTION MATERIAL you'l Ind that every N T 5 Shop Tested Home Iro ning asson and manual is easy to understand, with many numerous illustrations and diagrams. See for yourself Check the Actual Lasson you race to FREE along with our Opportunity Book Clip and mai coupon NOW!

MAIL NOW TO National Technical Schools, Dept C-129 4000 S. Figueroa St., Los Angeles 37, Calif

Please rush FREE Book and Actual Losson checked be on. No ob gallon. No salesman will ca-CHECK ONE ONLY

My Future in TV Rad in Electronics Book My Fatare in Auro Menha Ls & Diesel Book My Fatare in A. Conditioning Refrige at on & Frecht ca App ance Book

Name Age

Address

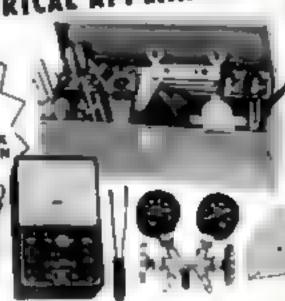
Zone

State Check your of extension that in Desident Printing of Co. Engeles VETERANS Give date of discharge



# e a Waster Echnician NE OF THESE 3 BIG PAY INDUSTRIES





TAKE YOUR CHOICE... be a successful all-pround car. truck and heavy-engine Mechanic. Or specialise in your favorite field...Tune-Up, Automatic Transmissions, Form Machanics, Trucks and Buses Stationary Installations. Foreign Cors, or get into Auto Air Conditioning, Engine Rebuilding, Diesel, and all the other high-pay fields too numerous to ment on here. Or go into husiness for yourself. Remember... a quantied ALL AROUND MECHANIC always has a good lob!

EVERY PHASE SHOP TESTED ... our streamlined lessons, manuals and other training materials are easy to understand, completely practical and right up-to-date. YOU AISO GET AND KEEP YATUABLE PROFESSIONAL EQUIP-MENT. We tend you a complete set of Mechanic's tools . an All-Metal Tool Box ... a Molor Analyzing Sel containing three valuable instruments in a sturdy corrying case... plus a Top Quality Sacket Wrench Set with fillings

PROVE IT TO YOURSELF ... N T.S. gives you everything you need to make more money in today's big, appartunity filled Auto Mechanics and Dresel Industry, Send coupon! FUTURE BRIGHT FOR TRAINED MASTER TECHNICIANS ... over 30,000 new Technicians must be trained annually. You are needed to help service and repair the 50 million air conditioners, refrigerators and electrical appliances that will need fixing this year alone. No wonder the Masfor Technician has sleady work, at high pay, year ofter year. You can go places in your own business or with a manufacturer, dealer id stributor or department store. With All Phase training, your earning power is unlimited to

JOB TRAINING AT HOME...you get Professional Technicion's Tools, Precision Instruments, PLUS a factory-made APPLIANCE TESTER... o full set of PRACTICAL, professional equipment I You use them to conduct over 100 experiments .. in your Spare Time Work while in training...and In your service, repair, and trouble-shooting work later on. It is all yours to keep!

DON'T LOSE OUT-FIND OUT...we'll rush you our big, illustrated OPPORTUNITY BOOK AND ACTUAL LESSON. No obligation. It costs nothing to find out, Mail coupon .. DO IT NOW!

SEND ONE OF THE 3 COUPONS TODAY! ASK ONE OR TWO FRIENDS TO DO THE SAME. IT'S FUN TO STUDY TOGETHER.

#### MAIL NOW TO

National Technical Schools, Dept. C-129 4000 S. Figueroa St., Los Angeles 37, Calif.

Please rush FREE Book and Actual Lesson checked below. No obligation. No salesman will call

CHECK DNE ONLY My Future in Auto Mechanics & Diesel Book My Future in TV-Radio E ectronics Book \* My Future in Air Conditioning, Refrigeration

& Electrica Apphiance Gook

Name Age Address

City. Zane\_ \_\_State\_

Church form It interested BNLT in Musident Francing at Las Augustes.

VETERANS. Give date of discharge

#### MAIL NOW TO

National Technical Schools, Dept C-129 4000 S. Figuerop St., Les Angeles 37, Colif.

Please rush FREE Book and Actual Lesson chacked below. No obligation. No salesman w... call.

CHECK ONE ONLY "My Future in Air Conditioning, Refrigeration

& Electrical Appliance Book My Future in TV-Rad o E ectron cs. Book

My Future in Auto-Mechanics & Diesel' Book

Age, Name

Address

State\_ City\_ Zone

Check here it interested WILT in desident Training at Los Angeles.

VETERANS Give date of discharge

## ...have you heard...?

good reasons. It's one of the commonest crimes; it's also one of the most expensive. Last year cars made up over half the dollar value—\$134,800,000—of all goods stolen. The average value per car was put at \$835.

Who steals them? Car stealing is primarily a teen-age crime. Over 64 percent of arrests made were of kids 18 or under. It's typical of the pattern of youthful crime, directed more towards property than persons. (Close to half those arrested for burglary and larceny were youngsters, too.)

About one out of every four cases of car theft is "cleared" off the books by arrest. The record is a little better in very big cities where police forces and facilities are larger.

A note of encouragement is the rate of recovery of the vehicles. Chances are better than nine out of 10 that your car will be found after it has been stolen. That's far better

Car Thefts pr 100,000 Inhabit	ants
Aibuquerque	638 7
Atlanta	292 3
Chicago	125 9
Denver	359.6
Detro t	2498
Los Angeles	416 7
New Orleans	560 2
New York	184 5
Phi adelphia	147 6
San Francisco	360.2
Washington D.C.	175 6

than the average rate of recovery for all other stolen goods—14 percent.

Let desperadoes beware: Police are taking arms against the crime rise. At a recent convention of police chiefs in New York a number of ingenious new weapons and gadgets were unveiled:

 An infrared telescope to enable police to observe others in pitch darkness.

 Field glasses with a built-in longrange camera.

 A tool that looks like a pistol, but with a long steel probe instead of a barrel, Its purpose? Guaranteed to open any lock.

 Motorcycles almost as big as foreign cars.



Are modern Europeans primitive? British scientist Dr. C. B. Goodhart has a new evolutionary theory that links beards and blushes with fighting and wooing. Primitive man was like the



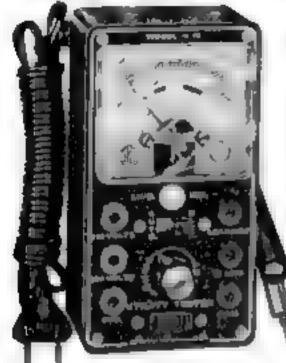
modern monkey, he says—he used his whiskers and hair to make himself look bigger and fiercer when fighting over a mate.

Because Europeans are the hairiest peoples in the world today (tropical races are practically hairless), he concludes they're probably the closest in appearance to our prehistoric ancestors.

Europeans are light-skinned, too. Dr. Goodhart connects that fact with the noticeable blush—characteristic of primates—that suffuses the maiden (or ape) lady's cheeks when she's being wooed. He figures that blushing, as a mating characteristic, evolved among the light-skinned races and was passed on to darker ones, where the blush became invisible.

Superior's New Model 70 UTILITY TESTER®

# FOR REPAIRING ALL ELECTRICAL APPLIANCES MOTORS-AUTOMOBILES-TV TUBES



As an electrical trouble shooter the Model 70:

 Will test Toosters, Irons, Broilers, Heating Pads, Clocks, Fons, Veccom Cleoners, Refrigerators, Lamps, Fluorescents, Switches, Thermostets, etc.

 Will test oil TV tubes for open filoments, inter-element shorts, burned out tubes, etc.

 Measures A.C. and D.C. Voltages, A.C. and D.C. Current, Resistances, Lookage, etc.  Will measure current consumption while the appliance under test is in operation.

 Incorporates a sensitive directreading resistance range which will measure all resistances commonly used in electrical appliances, motors, etc.

 Loakage detecting circuit will indicate continuity from zero ahms to 3 magohms (5,000,000 ahms).

As an Automotive Tester the Model 70 will test:

- Both 6 Valt and 12 Valt Storage Batteries - Generators - Starters 
Distributors - Ignition Coils - Regulators - Relays - Circuit Breakers

- Cigarotte Lighters - Stop Lights - Condensors - Directional Signal Systems - All Lamps and Bulbs - Fuses - Heating Systems - Herns - Also

will locate peer prounds, breaks in wiring, peer connections, etc.

IT'S SO EASY !!



With factor's and in netter, nurrent secumption of applicate in tend first on meter when line sord is commerced to receptarie on panel This typical tree taken.



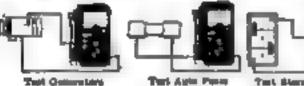
Couled abrushs of most formouse me be velte ablahapt from stopdares beared berrief Base's here to chest, recent thereteenshe so see if trives in it are then.



Small derivir has motor indicate \$6 shore (marma) reprinted).



Manual imposted with blades to altern meter upodin march to right true test lands are connected to paid I and I in this IA-OI to be framedors for lighting all below modin TV are detailed to messal.



READ THIS



Test Storage Statistics Tips Chropic Streeters PHISI



#### INCLUDED FREE!!

This <u>64-page book</u>—practically a condensed course in electricity. Learn by doing.

fust road the following partial list of contents:

what is ejectricity? • Simplified version of Ohms Law • What is wattage? • Simplified wattage charts • How to measure voltage current. resistance and leakage • How to test all electrical polynomials and standing templanes and

motors using a simplified trouble-shooting technique.

a How to test all TV tubes, also simple procedure for determining which specific tube (or tubes) is causing the trouble.

 How to trace trouble in the electrical sircults and parts in automobiles and trucks.

Model 70 comes complete with above \$15.85 hook and test femile. Only . . .

READ THIS!

You don't pay for the Model 70 until AFTER you have examined it in the privacy of your hama! Model 70 is

# SHIPPED ON APPROVAL NO MONEY WITH ORDER - NO C. O. D.

Try it for 10 days before you buy. If completely satisfied then send \$3.85 and pay balance at rate of \$4.00 per month for 3 months—No Interest or Finance Charges Added! If not completely satisfied, return to us, no explanation necessary.

Please rush me one if	9 Tenth Ave., New Yorkel 70. If satisfactor of sate of \$4 per more	ork 34, N. Y. y I agree to pay \$3.85 within nth until total price of \$15.85 may return for concellation of
Address		
City	Zone	State



## Why were these men great?

How does anyone—man or woman—achieve greatness? Is it not by mastery of the powers within ourselves?

Know the mysterious world within you! Attune yourself to the wisdom of the ages! Grasp the inner power of your mind! Learn the secrets of a full and peaceful life!

Benjamin Franklin, statesman and inventor . . . Isaac Newton, discoverer of the Law of Gravitation . . . Francis Bacon, philosopher

and scientist . . . like many other learned and great men and women . . . were Rosicrucians. The Rosicrucians (NOT religious organization) have been in existence for centuries. Today, headquarters of the Rosicrucians send over seven million pieces of mail annually to all parts of the world. Address: Scribe MKC



THIS BOOK

### The ROSICRUCIANS

San Jose

(AMORC)

California, U.S.A.

	-	44 1 44	-		- 1 d
-SIN	0 1	M 13		u .	D M-
			_		

Scribe M.K.C. The ROSICRUCIANS (AMORC) San Jose, California, U.S.A. Please send me the free book, The Mastery of Life, which explains how I may learn to use my faculties and powers of mind Name. Address\_\_\_\_\_ City. State\_

## "I'M MAKING **MORE THAN**



-reports Chas. Kema Texas, one of many who are "cleaning up" with orders for PRESTO\_Solones's New Midges Miracle Fire Extinguisher. So can you! Amaz ng new kind of fire extinguisher. Tiny Presto' does job of bulky ext nguishers that cost 4 times as much, and are 8 times as heavy Ends fires fast as 2 seconds. Never corredos. GUARANTEED for 20 years! Over 3 million sold! Sells for only \$4.95.

Show it to civil defense workers, owners of homes, care, but a farme etc. and to stores for re-tale - make good homes. H. J. Kerr reports \$20 a day. Wm. Wyds bs., L. J. an hour. Write for PRP, E. Saies KR. Noobligation.

MERLITE INDUSTRIES, Dopt. P-16 6 Prento Dist.
114 East 32nd Street, New York 36, New York
IN CANADA Mopa Co. Ltd., 371 Dowd Street, Montreel I, P. Q.



UIMALS, FISH, PETS Be a Taxideemost Save your hunting TRO-FREE BOOK To All about to 100 fine windtop At don't do my feet then WONDERFIL FREE
TODAY AND THE TOTAL DON'T STATE YOUR AGE,
M. W. SCHOOL OF TAXIDERMY, Dapt. 2012. Omaha, Nob.



## I'll Send You This Handsome SAMPLE CASE-FREE

and Show You How to Make Up to \$30.00 in a Day

Mail compon for this Free In forthing Sample Case packed with 100 beautiful this value auti and over cust taketes the Take arders from triangle. Section worthers, station, for fine quality trade to be managed clothes. Picket his cash profits in advance, Section as me for a subsequence, containing to read the second Percentage was ing our authorise over-

W. Z. GIBSON, INC., 800 South Throop Street BEFT T 520 - CHICAGO 7, ILLINOIS DEPT T 520

	Dear Str. 1 WANT A MADE TO MEASON AND SHOW without paying le for it. Russ Lit of agtani (abrics, ASSOLUTELY FREE	RE SUIT TO WEAR
ł	MANE.	AGE
	CITY	ATE

W. Z. 01990N, INC., Dogt. Y-529

## LAW TRAINING FOR BUSINESS (In spare time at home)

Earn LL. B. Degree

Thousands of men and women who never intend to practice Law are studying it in spare time at home as an aid to business advancement.

Today Law is involved in practically every business decision. In many lines of work it is almost indispensable. Law training develops keen, clear, quick, correct and deci-

sive thinking.

You can study LaSalle's American Law and Procedure right in the privacy of your own home-progressing as rapidly as your time and ability permit. For more than 50 years we have helped over 1,400,000 ambitious people get ahead in the business world.

A MOST UNUSUAL LAW LIBRARY

This training includes the 14-volume LaSalle Law Library -AMERICAN LAW AND PROCEDURE—that is the basis of all our instruction service. This library has been compiled by leaders in the field of Law. It covers the whole field in an orderly and simple manner that is easy to learn and understand. Collateral reading and printed lectures, furnished at regular intervals, supplement the texts. Law instructors personally supervise your program. Under the LaSalle method you learn by actually solving legal problems-not just memorizing rules.

WRITE FOR TWO FREE BOOKS

Send the coupon TODAY and find out how you can qualify.



Indispensable for home use... and never before priced so low! This compact, all steel, powerful SWINGLINE 101 staple gun is ideal for insulation, carpentry, uphoistery, screening, wire fencing, plus thousands of other uses. Handle locks to fit pocket. Lightweight, maneuverable, jam-prooff Staple sizes 14", 16". Send for FREE book-"Tips for Tacking".

Dept. S-12-9 Long Island City 1, New York

for the many fine openings available to the law-trained man. In our FREE books "Law Training for Leadership" and "Evidence" you will find answers to your questions about the study of Law and the LaSalle method, and how you can earn the LL, B Degree,

Accredited Member, National Home Study Council

#### MAIL COUPON TODAY-LA SALLE EXTENSION UNIVERSITY

A Correspondence Institution

Dept. 1283L Chicago S, ILL. 417 S. Doorborn St. Please send me. FRI E. "Law Training for Leadership" and "Evidence"

Name	b	*	٠	+	h	÷		+				*	h		d	+	+		h	b	A	H	,		
Address.			4		b	p.	4		4	+		+		4	+			h					h	h 1	

State .....

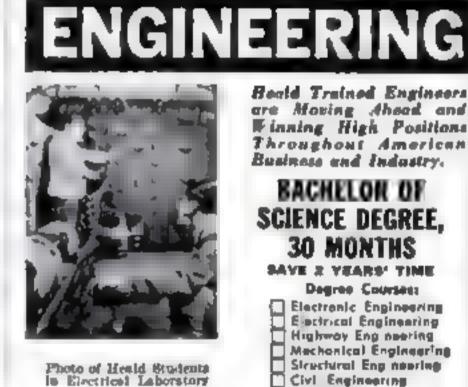


Photo of Heald Students in Electrical Laboratory

**Enroll How for New Yorm** 

Heald College Ranks FIRST ext of the Wilheston in "Wha a Who in America"

Soud for FREE Information

#### Heald Engineering College

Red, 1962 You Hels at Post, Dapt. PS-1257 San Francisco, Culifornia **Boald Trained Engineers** are Moving Ahead and Winning High Positions Throughout American Business and Industry.

## BACHELON OF SCIENCE DEGREE,

Degree Courses:

Electronic Engineering E-extracul Engineering Highway Eng neering Machonical Engineering Structural Engineering Civi Engineering Architecture

Dipl	eme	Course	leb I	
TELEY	VISIO	N D C	olec	T١
C Beck	ronic '	Techni	dan	
	traut f			
Tech.				
Tool !	L Die	Design	0	
	tecture			

Muchun col Drofling 3tructure) Draffine

Approvad for Veterans

NAME	
STREET	
CITY	
STATE	



#### LEARN AT HOME IN SPARE TIME (or at college in Chicago)

Check the want ads in any newspaper-SEE the bigpay opportunities open to you as a draftsman. What's more, you can bearn this well paid prestige profession at home—quickly enoly! No epocial takent needed Get complete, step by step Chicago Tech lessons in the mail, spend a few pleasant hours studying each we k In a short time you'll be a well-trained draftsman. ready to take your pick of many good jobs. Act now!



FREE IMPORMATION-MAIL COUPOR TODAY! Get FRFE TRIAL LESSON p us infor-to ition about C T C practical training Learn what successful Chicago Tech graduates say about high pay and opportunities in drafting No charge, or on Igation

CHIE	AGO	T	ECH	NICAL	COLLE	GE
\$ 227 T. Chicago	och Olds	i 30	00 Se.	Michigan A	ve.	
tun tios	PITER	CHRO	e with	information	about big o	ppor-
Name	1117				. Age	. , .
Address		4 1				
elen.				7000	Stale	

# BE AN AUTO-DIESEL EXPERT — LEARN

You earn fast in oir ships because you earn With look on real euroment Surent, stort ... money may earn mg t of their expenses by diving part I me work. Experienced neity fore early his WHY and show you HITW then you D3 IT YOUR Forty years experience training men Successful graduates in 50 states and mantore an countries. Many of our graduates earn \$1.5 a week and up Approved for veterans Day and evening lasses. Free building write foday.

NASHVILLE AUTO-DIESEL COLLEGE 226 7th Ave., No., Dept. 42, Neshville, Tenn.

### realize your dream

Become a graduate engineer. Then promotion will not pass you by. Share rewards awaiting college men . . . higher income, rapid advancement. Important firms interview seniors here regularly. Approved for Veterans.

#### Graduate Engineer in 27 months

B S. degree in Electrical Engineering (with either Electronics or Power major), also in Mechanical, Civil Chemical, Aeronautical Engineering in 36 Months a E S in Bus, ness Administration (General Business, Accounting, Motor Transport Management majors) For earnest, capable students. Small classes More professional class between Muture students. professional class hours. Mature students.

equipped labs, Modest costs, Year-round operation. Enter Jan., Mar., June Sept. Write J. F. McCorthy, Oirector Admissions, for Cotolog and "Your Career" Book.

# I-STATE COLLEGE

5129 College Ave. + Angolo, Indiana

There's money for you in

#### REPAIRING WATCH

Learn at home to repair at types of 5w ss. and American watches. Modern Sweazey System shows you haw stop by stop Tuilian \$5 month ly Diploma oworded Free sample lesson

#### CHICAGO SCHOOL OF WATCHMAKING

Dopt. 4129.

Chicago 47, Mi.

NEW!

Make good money servicing suin-truck-trarior radiators with new and repair radiators with new and repair radiators in and, world's largest radiates additional migr trains you free Brasil down payment starts you frowed merchandleing sesures returns. Profitable dept. for gasage of service station. Write

INLAND MFG. CO., Dopt. PS-12, 1108 Jackson St., Oranka 2, Nebr.



#### SUPER JU JITSU

Now get tough double quick! the set of the factors are the art of project of the set of the se



# Wide-Open Opportunities for Wide-Awake Men!

Good Jobs, Top Pay, Steady Work in

#### AIR CONDITIONING AND REFRIGERATION

#### A Practical Way To Train At Home

America's fastest-growing opportunity field is now Air Conditioning and Refrigeration! Already 150 million units are in use. The rapid growth of home and auto air conditioning

demands that 20,000 service technicians be trained each year. The work is clean and interesting-offers up to \$3 an hour and more. Good jobs are waiting. It's easy to go in business.



Muka Money As You Traig So practical is CTI

cash statalling and fixing units in spare time.

Mail Coupon For Valuable Free Information

It's easy to master this craft. Let CTI train you at home. You learn in months, Mail coupon for FREE book and Lasson Samples. Get facts now-decide later.

COMMERCIAL TRADES INSTITUTE . CHICAGO 26, ILL.



Learn by practicing. CTI sends 25 kits. You build

a heavy duty, 1, h.p. condensing unit (above). You get tools (left) You build an air conditioner, freezer, refrigerator or milk cooler. Mail coupon!

COMMERCIAL TRADES INSTITUTE 1400 Greenfeet Avenue . Chicage 26, Ill. Send book, Success in Air Conditioning & Aufrigoration, and Lassen Samples. Both FREE Zone\_\_ State Accredited by National Home Study Council

# "WE PAID FOR OUR HOME with a Foley Saw Filer"



Here is the true story of Lastia Patrick-as told by his wife, who wrote us about their success in a town of 12,000.

"I can truthfully say that when Mr. Patrick got his Foley, he made a good and wonderful investment. When we moved here in March, 1946, we had only a Model A Pickup and all our belongings were in it. Since then, my husband has done so well with his foley Saw Filing Machine and report shop that we bought a house and paid for it and have two nice boys; bought a new car and built on addition to our house; and he has got a lot of new machines in the shop that a person needs in business. Nicest of all, it is all paid for,"

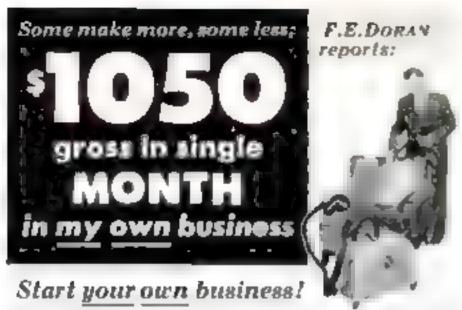
Make up to \$3 or \$5 an hour

With the new model 200 Faley Automatic Saw Filer, you can sharpen, hand, band, combination and cross-cut circular saws just like new. Start in spore time, in your gorage or basement. No experience needed, Build

Address

up a steady, repeat CASH business which will buy YOU'd home or new cor. Send coupon for FREE BOOK-"Money Making Facts" No salesman will call





Here's YOUR chance to start a money-making, year round business of your own and make the success you've dreamed about.

G. R. Adcock took in \$102 in one day, O. W. Hare landed a \$750 hotel job. J. S. Corbit grossed \$279.50 his first month. Homes, hotels, offices, clubs, offer you big profit possibilities. Auto upholstoring also,

NO SHOP OR OFFICE NECESSARY . You clean furniture on customers' premises. No hauling, no high rents. Supplies inexpensive; you operate from your own home. What you take in is mostly profit,

If you want to be your own bose—free from lay-offs and strikes, we will help you to start and succeed.

> This is not a lease proposition. You own the machine, you work when and where you please and all the money you take in is your own,

YON SCHRADER MPG. CO.----W11 "D" Pl., Racino, Wisconsia

FREE

Book

Without obligation rush your FREE booklet about how I can start my own permanent, profitable electric Upholetery Cleaning buginess.

Nome		
Address		
Сиу	Zone	State

#### Play the most popular instrument of all . . . for fun, leadership and of all . . . for fun, leadership and profit! Over 40 newest models of giorions tone and breathtuking besity offered at amaging low prices direct from world's largest dealer Sma down payment, easiest terms on belance Ettre bonus gifte free if you buy during this Trade Inc. seerples. Try before you buy on free 5 Day NO-RISK PLAN. Satisfaction government RISK PLAN. Satisfaction gos matered or money back. Double guarantes. Rush coupon for big new COLOR catalogs and lowest discount prices. ALL FREE! No obligation. Bend FREE Catalogs, low discount prices. ACCORDION MANUFACTURERS & WHOLESALERS OUTLET Popt. P-128, 2003 W. Chicago Ave., Chicago 22, Illinois NAME.

### **MAKE EXTRA CASH**

SHARPENING LAWN MOWERS THE MODERN WAY



Start year own shop! Full ur spara time. Earn many dollars in a short time . . . average \$5 00 per hour, Many mowers need sharp-ening. With MODERN'S Extra Reavy Duty LAWN MOWER SHARPENER AND BED KNIFE GRINDER YOU have 6 machines in one. All operations are done quickly and easily. You make money from the start. Write for free details.

MODERN MFG. CO. 160 N. Fair Oaks Ave. Deot. Pasadens, California

MAKE MONEY! HYDRAULIC< JACKS

Earn While You Learn At Home Wase in is \$5 as bout full or par time m der ampre inn ee field e Hydraulii beb Bupan Mir in al jurb in aufo iere ter allens cher body her iffe forms need services on the show you fell for Easy was by the properties.



is a rital Sec. 15 SURF OF ) AUR OWN! a the a lighter a great Job holp,

Thousands of successful graduates. Our 30th years Send NOW for FILEE estatog. No obligation G. I. Approved. NATIONAL BENDOL OF MEAT CUTTING, Dept. 81-2, Toledo 4, Ohio

# FREE

BOOK SHOWS TOU HOW

Cash in on big U. S. Import craze. Famous World Trader guides men, women to big profits on small imports. Get exciting imports at trifling cost abroad for full or space time home business. No previous experience or product investment Book, full detail s/res Writenew MellingerCo.

Dopt. 224C, 1717 Westwood, LosAngeles 28, California



20305 Grand Ave Ranses City. Mo.



# WILL YOUR CAR START TOMORROW MORNING?



Get push button starting instead of a push . . . .

Cold and Damp weather makes engines hard to start. Save time and temper with New Pyroil Push-Button Starting

TOM THUMB ADDING MACHINE

STARTING

FLUID

15 (4K) 51 (4K)

With besuited Leathersto carrying case.
MADE IN AMERICA BY AMERICANS
Beware of these (superted in lations
Adds Up to the Billion—1,000 000 000
Bubtracts—Multiplies—Divides
II, study (front—frantisely 100% Archites—
Leath one Fast Shock (suff Short Methan)—m
QUARANTEED FOR YOUR LIFETIME

Ideal for Housewives, Shoppers, Students, Englishers and Tax work. Take It to the Super Market Stave Stavery week. We pay postage if you could their tasts or money order or lost could your same A address and tony postage III note pour same A address and tony postage III note pour same I managed to the Tell wery 10 Day Free Tris. As after this Liptonized manage refunded by return deal the Liptonized manage refunded by return deal Agents Wall of Make that Manage Males only \$3.45 Agents Wall of Make that Manage Males of Top Quality accurage a sur only exactly on price Top Challet and Thomas Applied MacMine P.O. Box 5005, Oupt. 0.29, Philadelphia 11 Perms



## WANTED!

Mechanically Inclined Men to Qualify for

# FACTORY TRAINING

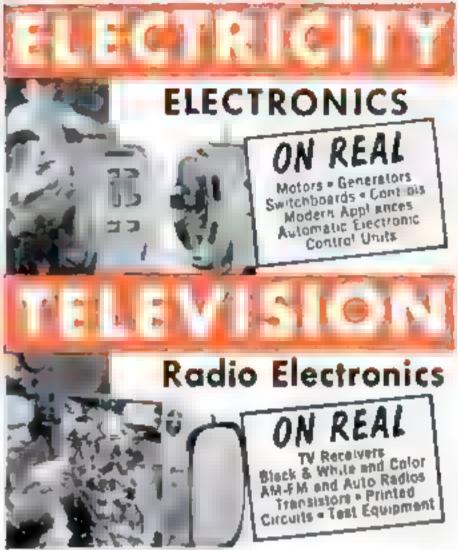


If you are interested in High Pay Jobs and Advancement in the Diesel field. . here's your opportunity' Qualified Factory-Trained men are in demand by highway builders, diesel manufacturers, truck line operators everywhere Interstate can help you qualify for tuition-free Cummins factory training and big pay diesel jobs! Write for complete information about Cummins-approved home training.

#### Get the Facts Today!

WRITE INTERSTATE TRAININ  wapt A.2, Fortland 12, Orago  RUSH information about Cummin and approved Home Study program	G SERVICE  n s tuition-free us.	Foctory	Troining
Name.			
Address			
City	Zone5	John	

# These men are getting practical training in ...



## Train in NEW Shop-Labs of

# COYNE

In Chicago—Bostrical and Sectronic Center of the World. Prepare for a better job and a successful future in a top opportunity riggo. Train on real full size equipment at COYNE where thousands of successful man have trained for 60 years—largest, oldest, best equipped school of its kind. Professional and experienced instructors show you how, then do practical jobs yourself on more than a quarter of a million dollars worth of equipment. No previous experience or advanced education beeded. Employment Service to Graduates.

Stort Now — Pay Later — Liberal Finance and Payment Plane. I'my most of turbin after graduation. Part-time employment help for atudents. Choose from nine yearly Starting Dates.

Mell Coupes or Write to Address Balow for Free Book - "Guide to Careers." Whether you prefer ELECTRICITY, TRLEVISION RADIO OF COMBINED ELECTRONICS TRAINING, which includes both fields, the book describes all training offered.

Information comes by mail. Na abligation and NO SALESMAN WILL CALL.

8 W Cooks, Jr., Pres. Founded 1899
COYNE ELECTRICAL SCHOOL

Chartered as an Educational Institution Not for Profit 1501 W. Congress Pkwy, Chicago 7, Ill., Dept. 99-4C

MAIL COUPON ST WRITE TO	M	AIL	CO	UPO	N	OR WRITE ADDRESS	OBLOW.
-------------------------	---	-----	----	-----	---	---------------------	--------

New Coyne Building, Dap 1501 W. Congress Plwy., Sund BIG FREE book and de	Chicago 7, III.
☐ Electricity ☐ Teler	_
Nome	
in the same of the	
City	State

(I understand no Salesman will coll)



Just imagine getting 2 filters for the price of one! Why? Simply because every LEE OIL FILTER is actually "two filters combined

to give you: - 1. Engine sludge filtration -The according pleated element removes sludge and abrasives too tiny for the eye to see!

2. ENGINE ACID FILTRATION — The built in, patented Fer dium\* Anode neutralizes and removes engineeating acids!

If you wan' TWICE AS MUCH engine protection AT NO EXTRA COST, insist on getting a LEE Feridium \* Anode OIL FILTER! Sold wherever cars are serviced and in accessory stores.

"I M Reg US Pat Off Pat Pend. LEE FILTER CORP., Depl. SD No. Artington, N. J.



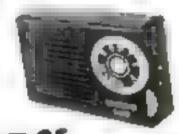
complete M enunce Course covering Divor) part that we are use truck necessaries. But

third plant at the least of the action of the country of the count

TEET TECHNICAL INSTITUTE

ATT: P L Hulch. Run 278 Brainteged III





Plays like \$19.951

Give 2 of these radios for the usual cost of 1 BUILT IN 21/5" SPEAKER phone jack for "private" earphone listening, powerful antenna that pulls in all major stations. Coneirad markings — all this in the gift bargain of the year! For students, youngsters, shut as office Handsome molded case Ship wt 2 lbs Accessory warphone, battery extra (see coupon)

**ELECTRONIC** GUIDE 35c



50 000 sold already! Newly published Radio Shack 1960 Buying Guide 312 book size 8: 7 × 11 rotogravure pages, Handsome illustrations, articles, charts, com. plete "specs" for over 40,000 dems. FREE

RABIO SHACK	Corpora	stion,	Dept.	123
739 Commonweak				

- FREE Bargain Catalogs

  Mew 1960 Fractions New 1960 Electronic Suying Guide @ 35c
- Transistor Portable 90L601 @ \$9.95 Earphone, 911166 to 69c

	Battery,	951030	59c	
B-1				

Name		
Address		
C	Chate	

12-month swoscription Famous Radio Shock "exclusives" in hi-fi, electronics. Tham radio, tools, ( ) Cash ( ) Check ( ) M O. ( ) C O.D. records

BARGAIN

CATALOGS

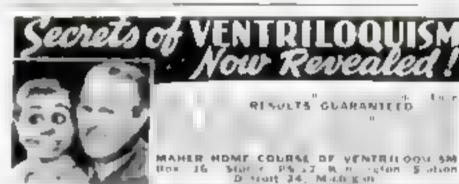


MANUFACTURE this BEAUTIFUL OUTDOOR FIREPLACE in YOUR OWN BACKYARD

\$4.00 worth of sond and cement produces this attractive fireprace Such on sight from \$60 to \$80 Easy to slort your own profitable but ness in your backyord. No experience necessary Big profits Exclusive manufacturing territories. Write immediately for full details. General machines sold to U.S. Government Dealer inquires Invited.

GENERAL ENGINES CO., INC. Phorotore. N. 130

We have taught thousands this sacisting profitable, pleasant profes in Let us leach you in your own huma. Learn Figure 1: he Proceed a Let us leach you in your own huma. Learn Figure 1: he Proceed a least for the Process Process in Proce



MASS PRODUCTION MAKES THESE PRICES POSSIBLETS Only world's largest boot hit maker can deliver such quality at runstout coton such prices! Kits from \$42, freight \$99.50 CATALO TAFT MARINE WOODCRAFT Dept. PS-1259 636 39th Ave. N.E., Minnespolis 21 Minn-

# You Can Have a

STRENGTHEN your voice this tested. scientific way. Yes you may now be able to improve the POWAR of voor speaking and singing voice in the preacy of your room' Sed thin he les-In the No music required. Bund, most y selem FREE BOOKLET

Write today for Ligo e Fouchtinger's great tentiet. How to Determ a Succer full tome it a about to p FRED Tou breat state pour age it is at maneal possible distribute and are RIGHT NOW!



No sale-man will bother

Profect Yours Institute, 210 S. Clinton St., Studio MR-1, Chippen 6, 116,



Beautifying buildings by Colorevels is a business exportunity awaiting men of modest capital everywhere. Owners of homes, stores, mateix, schools - almost any type of construction-are baking for means to give lifetime eye-appeal to drab or dirty cuncrote, stucce and similar matonry surfaces. Colorcreters can do such jobs, in fittle time and at little cost, and pocket generous profits, Colorcrate is a comentitious material, applied by oir pressure. Tough, tenecious, endering: 30 colors. Investigate this low-investment enterprise by writing for the Opportunity Sock

COLORCRETE INDUSTRIES, INC. 572 Ottown Ave., Halland, Mich.



#### High School Course Home Many Finish In 2 Years

Go as rapidly as your time and abilities permit Course equivalent to resident school work — prepares for college entrance exams Standard H S. texts supplied Deploma. Credit for H S. subjects stready completed Single notificited desired High school education is very important for advancement in business and industry and society. Then the handscaped all your To Se a High School graduate. Start your training now. Free States on request No chipation.

American School, Dept. 1986. Draxel et 58th, Chicago 37

## Want BIG PAY-Your Own Business?

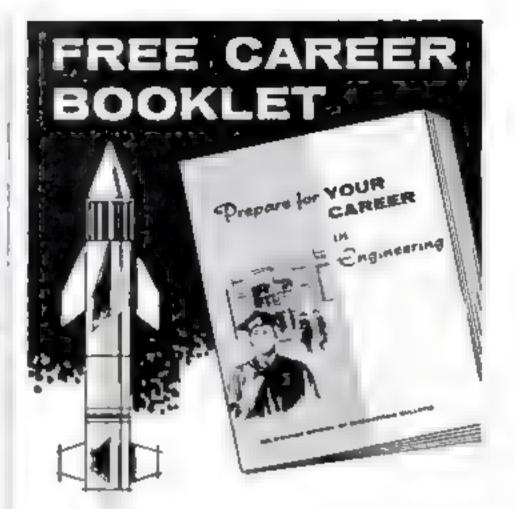


Tou can quick y step into a west-no d job or start a hig profit business of your own short-are of lock-m the means opportunities every-where space time or full time

EARN EXTRA MONEY FROM THE START! Age, aducation. Militor physical bank care making in this growing aready accome trade early fact at home gold pre-real expertments well-it extrained extens Total do real under the personal guidance of superty for Factors Val. House Study townest. AUI SI Iclad Tea

big pay job send for FREE diustra ed book. Mail coupon at once No salesman will rail approved for Veterant. Locksmithing intliger Och 212-9, 150 Park Ave., E. Butherford, N. J.

Lucksmitte lext., Dept. 212-7, 150 Pork Ave., E. Rotherford, E. J. Please send FREE and without obligation Ulmstrated book. Olty ..... State .. ..



To guide you to a successful future in

#### METALLURGY MECHANICAL ENGINEERING AIR CONDITIONING INDUSTRIAL TECHNOLOGY

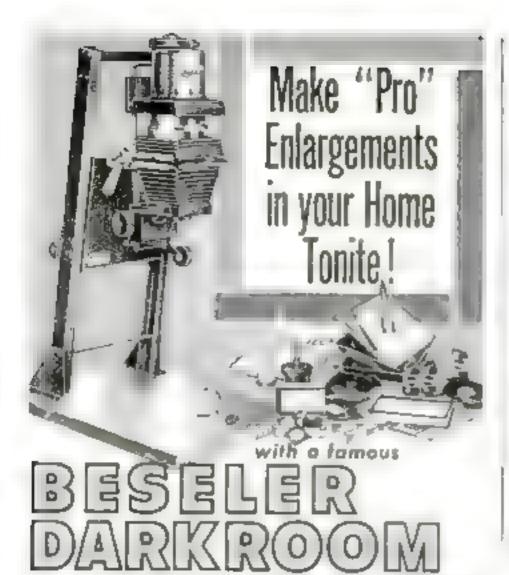
This interesting pictorial booklet tells you how you can prepare for a dynamic career as a Mechanical Engineer or Engineering Technician in such rewarding fields as:

DEVELOPMENT - RESEARCH - SELLING PRODUCT DESIGN . PURCHASING QUALITY CONTROL . TIME STUDY

Get all the facts about job opportunities, length of study, courses offered, degrees you can earn, scholarships, part-time work - as well as pictures of the Milwaukee School of Engineering's educational and recreational facilities. No obligation — it's yours free.

#### MILWAUKEE SCHOOL OF ENGINEERING

MAIL COL	PON TODAY!
Please send FREE "	Milwauken St., Milwaykan, Wis.
Name	ie entre
Address	
City  I'm eligible for vet  Ducharge date	Zone State erans education benefits. 85-118



. . . In your own basement, bathroom, kitchen, closet or clubhouse!

Taking pictures is twice the fun when you make them into giant enlargements. Dutfit with lans, chemicals, paper, trays, easel, timer. Beseler 230 Enlarger. purchased individually, would cost \$2871



CORONADO WEST SIN

Complete firth

	MAIL THIS COUPON TONITE	
CHARLES BE 214 \$, 10th Piense runh	SELER CO.  St., East Grange, N. J.  my FREE booklet,  be Darkroom."	3
1841		
Appesse		
C 97	2001 91670	
D1969, Charles Senries	Company	

## GOVT. ELECTRONIC SURPLUS

SEE IN COMPLETE DARKNESS

Mary Infra Red Receiver U L. Type C 3 with Schm di Lens Type C 3 with Schm of Lens
RCA portable precis on instrument
powered by 3 nest ight batteries
lets you see in total darkness
(when used with inlea-reg (ight
nource) Contains glaberate outca' system high voltage hower
tapply and image tube (1975)
Unit is light we git . 61 a ling
Excellent condition. With waterproof excepting case each \$15
Infra-red lifter for source (ight.
23 of tip, x tip.



#### MIGH QUALITY OPTICAL PARTS

Schmidt Olfra-High Speed Objective Lens System Castman Rodah ntra-red receiver (Mavy Metascope, Type 2, 7' tong. 5' \$CHWIDT objective tent (approx 7 0 3). Elaborate aptical system, many toated tenters Uses 2 peniight batteries to activate the phosphor batton. Govt cust approx 5300. Shipping weight, 9 lbs. Factory new. \$19.95

Waterproof carrying case 53 extra-

No COD's, Romit Full Amount With Order, Prices F.O.B. Pasadeou

C&H SALES CO.

2176 E. Colorado St. Panadona B. Culit.

# ob Invention Puta You in

Home Operators now make \$3.40 AN HOUR in busiwass ence monopolized by a few big companies

Special rubber stamps bring high prices cost only pennies to make on new low-cost table top machine Take 27 couls worth of material,



#### GET ELECTRONIC

I I training leads to specess as technic and flesh one nepra see a frequency of the second courses to hearty & state a surface of the second and the second a

VALPARAISO TECHNICAL INSTITUTE VALPARAISO, INDIANA



#### BIG EARNINGS WAITING TYPEWRITER REPAIRMEN

the state of the s demand a too

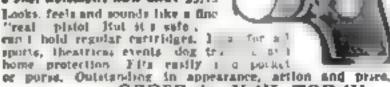
TYPEWRITER REPAIR SCHOOL, INC. Dept 68-29-150 Park Ave. E. Rutherford, N. J. 2-2-16-16-20 June J. Cont. Dept. of Little

TOU PE IN BUSINESS RIGHT OFF-Practical course. complete up noisterer a ton a materials, fr mes. all you need to earn while you learn AT HOME N Y State approved training in appointary it is Catalog FREE Sample Lesson Write Today Approved for Vets. Accredited by N II S.C.

Uphalstery Tender School, Dept. M.K. 1412, 721 Broadway, New York 3, M.Y.

#### FOR SPORTS, FUN OR FOR SELF-PROTECTION!

World's Finnet Blank Pistol .27 Cal & Shot Automotic NOW COLY \$5,45



ORDER by MAIL TODAY Godfrey Import Corp., Dept. PS-12, 261 Brandway, H. Y. 7, N. Y.



BE FREE FROM TRUSS SLAVERY
Surely you want to THROW AWAY TRUSSES FOR-

EVER, be rid of Rupture Worries. Then Why Do you put up with wearing a griping, chaling and unsanitary trum the balance of your life? If you do, it will NOT be through necessity but through choice on your part.

Now there is a new modern Non-Surgical treatment that is designed to permanently correct rupture. These Non-Surgical treatments are so certain, that a Lifetime Certificate of Assurance is given. Write today for our New FREE Book that gives facts that may save you painful, expensive surgery. Tells how non-surgically you may again work, live, play, love and enjoy life in the manner you desire. There is no obligation. Excelsion Medical Clinic, Dept. Me224, Excelsion Springs, Me.



100% cartified protection

Rush coupen for datally

appreciate how much fun the Phisharmonic can bring into your home. Details free

#### PHILHARMONIC ORGAN CORPORATION

Dept. P-129, 2003 West Chicago Avenue, Chicago 22, Illinois

## Make \$500 CASH PRO

THE DAY YOU START!



#### START YOUR OWN BUSINESS AT HOME... SHARPEN HOUSEHOLD, GARDEN AND SHOP TOOLS IN SPARE TIME

Now you can turn spare time into Big Cash Profits with new Belsaw Sharp-All. Sharpen knives, scissors, shears, snips, ice skates, mower biades, hedge trimmers, grass whips, axes, chisels, screw drivers, scrapers and saws . . . just about any household, garden and shop tool. Your own CASH business with no inventory. No calls to make. No experience milded.

Learn how easily you gan start your own spare time business. Amozing low cost easy-payment plan. Send postcord for FREE BOOK.

BELSAW SHARP-ALL CO Kenses City 11, Missouri 700 Field Bldg. . .

# way to train for BIG PAY!

The amazing new CTI Home Training Plan in Au-Mechanics is so practical it starts you earning spare-

time money in weeks-makes you an expert mechanic in months! It is better written, more clearly illustrated, more understandable. It offers more up-to-date, usable knowledge. CTI also sends you Mechanic's Tools and Testing Instruments (Compres-

sion Tester, Ignition Timing Light, Vacuum Gauge & Fuel Pump Tester.) CTI offers you added training, free of extra cost, in Diesel Mechanics or Body & Fender Rebuilding, Mail coupon for new booklet which tells of America's need for 100,000 mechanics and 25,000 shops. Sample Lessons

\_\_ STATE.

ZONE\_\_



ADDRESS.

metuded. Act today:
COMMERCIAL TRADES INSTITUTE Popt. A1194
1400 Greenleaf Avenue + Chicago 26, Ulinois
Send backlet, Moke by Money in Auto Mechanics
NameAge
Address
Accred fed by Not one! Home Study Council

My name is Charles Atlas. I can't promise you'll win the title of "World's Most Perfectly Developed Man\* as I did. But I do believe I can make a powerful He-Man of you -in a very short time. You can prove it to yourself -- at my risk. My big free book tells how to do it.

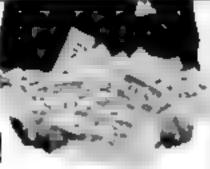




FREE BOOK Mail coupon new for free 32 - page book. Tells how I can give you "Stand-Out" muscles - how Dynamic Tension can make you a new man - confident, popular, successful Rush coupon to me personally: CHARLES ATLAS, Dept. 1M. 115 E. 23 St., N.Y. 10.

CHARLES ATLAS, Dept. 1M, 115 East 23rd St., New York 10, N. Y.
Dear Charles Atlas - Here's the Etnd of Body I Want: (Check as many as you like)
Slimmer Walst, Hips   Mere Pewerful   Broader Chest, Arms, Grip
Shoulders Mare Powerful Logs Mare Weight, Salid Better Energy, Sleep
Bend me, absolutely FREE a copy of your famous book showing how Dynamic Tension 'can make me a new man 32 pages, crammed with photographs answers to vital questions, and variable advice. No obligation.
Name
Address
City

## FINANCIAL HELP TO START YOUR OWN HOME BUSINESS



Tired of being squeezed between thing prices and a stationary anlary? I ould you use a nice little home-humans to bring in extra parame (turn your apare time, evenings and week-ends? I can show you have will even help finance you. If you to short of cash. Sound unregs subje? Wundering how I can afford to do it? Well it a sumple The basiness I in talking about uses supplies. I make and disterbute those supplies. So do other firms but I m widing to gamble that when your business gets risking you'll rather do business with a friend than with atrangers who did not above up uptil you were in the money. I've combind the same way with hundreds of others, and it has paid off by between me but I the hargest business of its had in the world. The Colden Hale of the unio others gozde for those who give it a fair trial.

What is the himness? It a printing arthoid a press on amazing process I call Screen Print!" With it you can him out printing in gargeons relating that many his shape cannot duplicate even with presses conting thousands of dollars. Yet my equipment frapplied to you with my instructional relighenally a few pounds. can be set up on a small table in the corner of your garage have ment after or even a hedroom, You can carn in a less house to print on paper metal, glass passir, leather cloth, and about any thing you can name - even on curved or round surfaces that ordinary printing presses cannot handle at all! And I show you how to get big-profit profess from stores. Instores, theatres, schools, and practically every type of business or organization for miles around

- even by MAIL ORDER court to court



JUST SEND ME YOUR NAME & ADDRESS-NO MONEY Remember I'll help finance you so don't worry about the money whether you are employed or not 1 m auce I can help you get eet in a home busness that may settle your money problems forever. Just send name and address for FREE information. without obugation, TODA's SIHE

Mr. C. J. Nowak, President, Screen Print Co., Dept. 112,15127 S. Broadway, Los Angeles 61 California



IN YOUR SPARE TIME

FIX SMALL GASOLINE ENGINES Quitheard • Pewermower • Chain Sow • Tractor MAKE EXTRA MONEY- or, resolt your angines and SAVE, Mustrated, pasy-teunderstand, Same Study Course. FREE Informetion. Write IDOAT!

LINCOLN TECHNICAL INSTITUTE 472 Market Street, Howark S, New Jersey



#### STUDY TO BE A DOCTOR of Psychology or Metaphysics

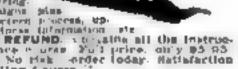
Obtain a Ps D., Ms D., or Ph.D. He a Teacher, Lecturer or Accredited Practitioner. Teach others how to schieve Health, Rappiness and Contentment. Chartered by State. Correspondence courses only. Write for PREE book tailing how

#### THE NEOTARIAN FELLOWSHIP

Deak 5, Pickwick Building

Kansas City 4, Museurl

Name-Study Course—Only \$5.95 Tracker pro commercial sign pointing and sign building as it is being done TOP by in conduct as it is being done TOP by in conduct as one is the country Compilete practical control for or ! Assume the country Compilete practical control for or ! Assume the action of their relations of their strings after the country would be the sold referred process, up to done algorithms and the sold referred process, up to done algorithms and the instruction of a high process control on REFUND. A tracking all the instruction of a high process control on the process of the control of the process of the control of the instruction on manage back! Under a light Pathling Course.



MELSON-MALL CO., 210 S. Clinton St., Dopt. 2MR-1, Chicago 6, Ill.

#### "How To Start Your Own IL ORDER BUSINESS"

Operate from your home during spare time. Mail Catalogs and sales literature to new mothers. Offer body items at big discounts. You receive all urders but carry no stock. We drop this for you. Write today for free booklet and franchise data. MAIL ORDER ASSOCIATES, MAYWOOD 2, NEW JERSEY

#### RADIO PLAYS FOR 10 YEARS!



#### MB TUBES—TRANSISTORS— SATTERIES OR "PLUG-INS" HEEDED

Smaller than a pack of cigarettes 1960. toode herer runs down or burns out too anised to rece we lock rad a sistions need to rece we lock rad a sistions need to rece we lock rad a sistions need to rece we lock rad a sistion took, anythine, anywhere—without EXTRA ANYENIA WIRLE Easy thumb station tupor. Forms wave detector throme black player wave to strain the player of the transfer of the case of, mol and pay

SEND ONLY 52.00 cach cb, mol and pay services or send \$6.99 for postpaid de terry Sent complete.

Ready to these with 10 year guarantee No extra to buy Pres 1000 m a antenna envioued if you order at once milway Company Dept TPS-12 KEARNEY NEED.

.......................



Port Chester, N.Y.

AT HOME IN SPARE TIME

Choice of Mechanical, Architectural, Aerosautical under guidence of licensed engineers and architects, V.A. upproved. Write for FREE success book and sample lesson

CLEVELAND ENGINEERING INSTITUTE Dept PS (2) = 6300 Euc id + Cleveland J. Ohio

Pamous SPEEDWRITING shorthand, 130 words per minute. No symbols no machines uses ABC a. Learn at home or through classroom instruction. Low cost, 500,006 graduates. For basiness and Civil Service Typing available. 17th Year Schools in



## HELICOPTER

331 No. Main St.

Build your own low cost one-man 'copter glider from factory kits. Easy to build, costs nothing to fly. Thousands successfully flying world over. Send \$5 NOW for 3-view draw-



ings, construction manual and flying instructions.

BENSEN AIRCRAFT CORP., Dept. PS-129 P O. Box 2746, Raleigh, N. C.



EARN BIG MONEY ... LEARN AT HOME IN SPARE TIME

train of or art ability with the "Famous System of Manual Training!" With this modern streamfined method, you learn rapidly and easily, start to car-toon immediately without tedious sludy or exercises

At all dealers or write direct.

Wide Demand for Cartoonists. Lars While Too Learn Magazines, newspapers, mov les, television, ad agencies

all are searching for new carloon ideas and talent As a successful. Continental tra ned Cartoon at your surnings are not lim- for the asking. Use coupon

You don't need previous ited Many of our students start earning after first few lessons A wonderful pastime too

Wa Supply Everything As our student you rece to PREE of extra cost a big contain ng a , equ pment and mater als you need and valueble Art collect Model that helps you draw any human pose

Got All the Facts FREE Big. colorful Free catalog gives a. deta is plus pages of useful information FREE.



forget it!



Col	nf	inental	5	hools	, 1	nc.
4201	8.	BROADWAY,	1.05	ANGELES	37,	CALI

Continuetal Schools, lot.

Dept B-12 4202 S Broadway, Los Angeles 37, Calif
Figure rush me your free Catalog and other informat on by return mail. No charge or abligation, no ballet-

HAME	 	_
CITY		



## BE YOUR OWN MUSIC TEACHER

Send for Free Book Telling New Easily You Can Learn Plane, Guitar, Accordion, ANY Instrument This EASY A-B-C Way

Now IT'S EASY to learn music at home No tirescine exercises. No teacher just START RIGHT OUT playing simple pieces. Thousands now play who never thought they could. Our pictured lessons make it casy as A-B-C to learn to play popular country, music hymns, classical and any other music. Only a few cents a lesson. Some of our 1 000 000 students like Lawrence Welk, are now band LEADERS' (Our 61st year.)



Moli Coupen for FREE Book

Find out why our rethod can

find by a sprk'y costy separate

to be a work'y costy separate

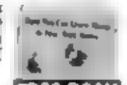
to see which is no higher a seried

to see a set to be presented to see a seried

to see a set to be a set to be presented to see a seried

for the destruction of Just made coup
jour (See a remote which all )

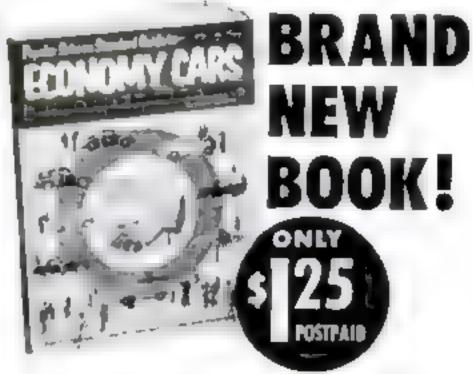
Brudes A1512 Port Washington N Y



U. S. SCHOOL OF MUSIC, Studie A1512, Perf Weshington, N. Y. P. again would not Free att page of metratest floats. I wested the to play Name tradestant

(see radionin	In stratules	
Круме	Prose Penil Age	
Ashipusa		
t -02	Zam State	
TX.	YOU! TI	EED HIS
1	GIANT 1960 CATALO	G
	ADIO 960 EVERYTON AND TV AN ELECTRONICS	HIVA HO
I	TOO S NEW MY LISTED PORTO PORTO PORTO OTHER CAT	ES AINS
	BURSTEIN-APPLEBEE C	0.
	Dupt. PS, 1012 McGee St., Kunsus City 6,	
	_ Sun . Free a B-A Caralog No. 60,	į
	Name	— į
SENS FOR FE	Address	_ i
POBAY	C ty State State	

# Everything you want to know about Economy Cars in this



Popular Science Standard Guide to Economy Cars is the year's biggest value to any man buying a car today! Completely illustrated with more than 400 photos and cutaway drawings! Gives actual facts, figures, prices and dimensions of every foreign and U. S. economy car on the market today!

Thousands of never-before-published facts on gas mileage, initial cost, repair and upkeep, leg and head room, safety features, comfort, mad-ability, transmissions, spare parts, accessories. Schematic drawings show you in feet and inches actual space in every model! Amazingly complete in all details! Handsome photographs let you compare and pick the car that suits your family's needs best!

THEY'RE ALL HERE: Minicars, Compact Cars, Small Cars, Convertibles, Sedans, Station Wagons! Frankly details and discusses the advantages and drawbacks of each of the 37 names manufactured today. All information based on actual driving experience in stock cars. Handy Glossary of Terms.

Don't delay! Order your copy of Popular Science Standard Guide to Economy Cars for just \$1.25 NOW! Guaranteed to please you or your money back!



Popular Science Publishing Inc. 255 Laxington Avenue, New York 17, N. Y.	1259
Here's my remittance! Rush mecopie Popular Science Standard Guide to Economy ( illustrated and bound in hard-gloss paper @ 5 per copy, postpaid. Money-back guarantee.	Čeren.
Name	_

ity\_\_\_\_State\_\_\_

## Shrinks Hemorrhoids New Way Without Surgery Stops Itch - Relieves Pain

For the first time science has found a new healing substance with the astonishing ability to shrink hemorrhoids and to relieve pain—without surgery.

In case after case, while gently relieving pain. actual reduction (abrinkage) took place.

Most amazing of all—results were so thorough that sufferers made astonishing statements like "Piles have ceased to be a problem"

The secret is a new healing substance (Bio-Dyne\*)—discovery of a world-famous research institute.

This substance is now available in suppository or cintment form under the name Preparation H.\* Ask for it at all drug countersmoney back guarantee. \*Rest. U.S. Pat. Off.



## \$3.25 or 2 FOR \$6.00!

With 40 ft. of wire. Additional wire 3¢ a ft.

#### TESTED AND GUARANTEED

Write for free list of all types of telephones. Shipments FOB, Simpson, Pa.

TELEPHONE ENGINEERING CO. Dopt. 12AP Simpson, Po.

## Catalog • 2900 Novelties 10c

Bend 10c for amazing catalog of novelities, live mimais, aclantific supplies hopbies, furnamers planes & boats looms magic tricks, joke articles unusual seeds sade of timesavers cameras, natical goods projectors, movies, lucky jewelry religious novelites dispuses musical instruments, mamps coins, gusties fortune to tere, radios, auto & bike accustories to escapes, magnifers, compasses, banks, amokers' padavis, artists supplies, printing sets regimes, majors, thuckers, knives, hitfolds, fireworks, guns, railes, mogra, books, games, plants, etc. Send same, address & loc for lowers, and a color of the colors. JOHNBON SMITH & CO., Dest. 460 Detroit 7. Michigan

ENGINEERING

## DEGREE IN 27 MONTHS

Students given option of studying program leading to Buckelor of Beience Depree in 27 months of the hundred four year anomal leading to Sockeler of Engineering Degree in 38 mentas. The S. S. degree in Muthematics
them stry or Physics (including Noclear Physics) may be carred
in 36 meeths. By attending classes year round, students can
granate in 3 years at I have one year of experience and meant
in the time data by needed to complete a four year college course
Preparatory courses, Thorough, practical program, Individualized
instruction

Keeping pace with progress in secures and engineering Campus Dornes Fym praying helds. Summer faculty 2 000 students New Dana Science Sullding, Low tuttion, Early Students from 50 states 40 forego countries, Sand categori for free catalog full informat on Enroll now!

6129 E. Washington Boulevard, Fort Wayne 2, Indiana Pisage send me free information on 27 me. B.S. DEGREES in ☐ Riectrical ■ Civil [ Aeronaulica) ☐ Chemical

(i) Mechanical on 31 mo. B.E. DEGREES in Aeronauli el Chemical Civil Mechanic Aeronauti el Mechanical

on 38 ma. S.S. DEGREES in Chemistry

Name...

Address...



EASY TO APPLY, PLIOBOND requires no mixing, brushes on, driet rapidly.

STAINLESS STEEL

EXCELLENT ADMESION, PLIOBOND exhibits exceptional strength - up to 1600 lbs./sq. In. in shear tests.

EXTREMELY DURABLE, PLICEOND resists age, heat, cold, water, chemi-



nd -T. M. The Goodynar Tire & Rubber Company, Akron. Ohio

## OWN a BUSINESS

## Be a Specialist in a Booming Industry



Get in on the ground floor of a booming \$150 million a year industry Fill the need in your area for safe, effective "on location" cleaning of carpets and upholstery.

Every home houses a customer! We li train and catabileh you in your OWN I fetime business. Start part-time if employed You'll be trained by a nearby dealer and at 50-hour school. You provide 6 services to multiply profits. You get exclusive use of process which cleans without harmful scrubbing, seaking, shrinkage. It's acclaimed by housewives, manufacturers and lincked by famous McCala and Parents Seals. No shop needed. Just 2 jobs a day nets \$1,750,00 first year.

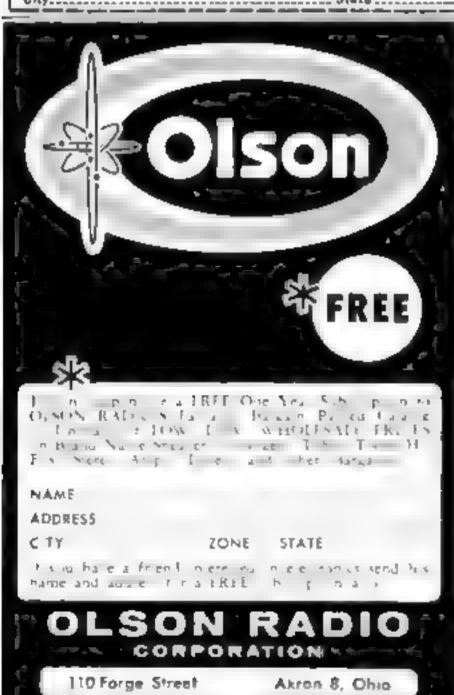
P YOU GROW Our whole program is conperative: thus, continuous assistance program designed to build your business. You receive continuous course his from specialists at Hilytes. You're backed by Nationa, Advertising in Parents' House & Gardens, Met al a others; ade in national trade mayar nes target retailers in your fown to refer enstowers to you Others among & regular services you receive are conventions regional conferences, product development sales inters advorticing life, monthly inagration. Free bicklets explain everything No obligation. No salesman wie, call Be write for Free Booklets inday!

DURACLEAN CO., 9-3 FD Duraclean Bldg., Deerfield, III.

## A BUSINESS" COUPON

DURACLEAN CO., 9-140 Duraciosa Sidg., Deorfield, Illinois

Without obligation, rush me FREE 14-page booklets giving full details on a dealership in my town.



## \$1 BRINGS YOU

Discover Flok-Kraft and Earn \$\$\$\$\$ AT HOME

Earn up to \$13.00 per hour spare time Amazing new Velvet ober spray instantly tolder any object (Lamps Badio & TV tabless Figurines, Signs, Auto dash boards toys furthers drapetics auxiliance) worth expensive \$6565 Prices. like maget you can spray any-hing with this beautifus new suedulate finish that (equalities put Velvet.

#### EARN UP TO \$300.00 PER WEEK SPARE TIME

Limiting materials cost only Sc per square foot. Average TV or radio cabing can be beautifully a rayed with this start for new 4 drives into 5 to 5 to 50, 0 and 10 minutes at 5 cost or on the in materials. Your charge for this 100 is at least \$10 00 b.

#### REPRESENTATIVES ON YOUR AREA URGENTLY NEEDED

Own your own busine - Work's home in your spate time Help for the home in we head full for the amazing new head full Velve fibes for highest architects auto deniers —everywhere Possible 820 000 (800 00 mm) of labe to be done laves take oday—be first in your

Actual agenties in 14 Hadiant Colors Booklet of AD Home Business Of the Court Industries, Los Angeles \$1, Calif., Dept. A-13.



## ADD # 25 POUNDS of SOLID MUSCLES # POUNDS

CATALOG SAME CONTROL OF CONTROL PARK WITH CATALOG SAME CA

#### TEST YOUR OWN now! RADIO TUBES



all of them—even picture tube

No. 1 had not IV service on a gree due to the extinue from the transfer almost a fingupolia act gives have the surement while shows after the three who is not transfer to the Ohman are not to the three from a negligible of the first from a negligible of the first from a finite first from the first fr

## EXCLUSIVE DOUBLE-BEARING DUTY PUMPS PRIMATE - DRAIN - CIRCULATE - SPRAY or 2 If double of larger - 2 If for op (a) I also GPH; outlet Stanton shift TYPE R—2 oil less \$10.95 refer bearing. What rout TYPE 15—The tractor model \$12.95 Rest for both driver Postport if cost with order Don't delay pand for yours reduct MONEY BACK GUARANTES Contributer and Goar Purion in All Black

LABAWCO PUMPS Balls Mond 4. N J



t ards, Stationery Advertising Circulars, labels photo and movie tit es, church work, tags, etc. Save money Sold direct from fac-

Own a Printing Business

Complete the Control of the catalog of mosts and a superior for free catalog of mosts and a superior for free catalog of mosts and a superior at the catalog of the catalog of

KELSEY PRESSES, C-33 Moridon, Conn.



We need New Ideas FOR RECORDING . . Your Songs or Poems may EARN MONEY FOR YOU!

Songs Recorded—Royalties Poid

FREE EXAMINATION

MAIL TO: STAR-CREST RECORDING CO.

Dept. C-6, 1350 ... Highland, Hollywood 28, Calif.



The Designer—FRANK KURTIS designed more than 120 Indianapolis 500 cars, including five of the last nine winners. The Test Driver—RODGER WARD 1959 Indianapolis 500 winner. Rush Coupon, is Percival's racing consultant. for FREE Intermution The result—THE HELLCAT, Everything you want— PERCIYAL MEG. CO. DEPT. 708 speed, instant response, safety and endurance. 1446 WALNUT DES MOINES, IOWA The hottest, sweetest handling kart going. NAME Halicat easily converts to class B. C. ADDRESS. competition. Also available in Moot All Wildest, Cubest models. Requirements of AKMA and GKCA CITY. Dealer Inquiries Champleaship Competition Regulations STATE Invited

## 8FT. SPECIALS - 809



Mammoth man manifold These Blant a protect of authorities for the or institute for the fine for the parties of the beach of further profession for the beach of further and the last of the first create or the beach of the batter of the first or the first of the first of the parties of their original cost or their original cost of their original cost of their original cost of their original cost or their original cost of their original cost of their original cost or their original cost of their original cost of their original cost or their original cost origi

4" dia.-80c oc. 3 for \$1.50 15" dia.-\$1 95 ca.-20" dia.-\$4.95 ca.

Postage pd on post sectors (a) co- aid soles (a)

FRANK SALES, Bopt. PS-1259, 3930 Summet Bird., Los Angeles 29, Colif.

THE BATTERY THAT'S USED IN GUIDED MISSILES NOW RELEASED AS GOVERNMENT SURPLUS



For Photogrophy, Alexant, Models, \$1.35 ca.

Seorchights, Rodon, etc.

Sinceres are Nickel Lagarium altaline appeared in a cross designed for Nickel Lagarium altaline appeared in a cross designed for Nickel Lagarium altaline appeared in a cross designed for Nickel Lagarium altaline appeared to the bary with be known I tally of service over 3000 recharges on test without loss of capacity of the graph without to be average to the colon of the weight without to be average to the colon of the proof to the cell in a contrast to harm clathing or example and appeared and proof construction discharge in any pass of intelligible and the without description of operates 40 temperatures (60° F to 200° F to 20

24 V. Bettery 27 ce is a meta case 1 sed \$40.00 km \$60.00 Al. cel's guaranteed to year satisfaction or money reflected (test Presupe) Plante active cases may have all gett cracks trained or such besteled cement or you may add 25c to insure uncracked cases for each cel.

ESSE RADIO COMPANY Dept D4
42 W. SOUTH STREET (MDIANAPOLIS 25. INDIANA

## TRAINED MEN NEEDED!

BIG PAY! - GOOD FUTURE!

DIESEL

ELECTRONICS

AUTO AUTOMATION

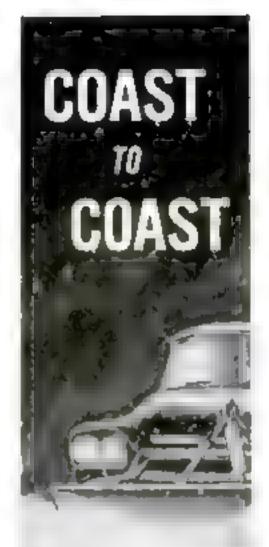
NEVER BEFORE has the opportunity been so good for the properly trained mechanic and technician to step into BIG PAY POSITIONS with rapid advancement and future security virtually

YOUR SUCCESS depends on the quality of training you receive . . . and the reputation of the school you attend.

YOUR SUSPANTEE we are giving the best in mechanical and technical training is proved by the fact... High pay jobs in Industry, and ratings in the Armed Forces now waiting for our graduates.

RESIDENT SHOP TRAMING is equier and costs loss than you may think! We provide you with housing and part-time jobs while in school, plus free pation-wide placement service for graduates.

plus free	pation-wide	biscemen	t mervice	for
graduntes				
Check subject	above in which	you are into	rested and c	well for
· · · · · · · · · · · · · · · · · · ·	FREE	COKLET		
-Citibes			- 11	18 Page 1
That There	BAI	LE	VИ	Subject Control
				77.2
SISCIRONICS -	F 1 2 1	0-1-	-1-1	in // "7
	echnical	2cuo	OIS EX	SEL
2010		Approved		Live
AUTOMATION			MEC	MA MAGE
1	650 S. Grand,	St. Louis 4	Me.	
Name			_ ^**	
Street				
		-	*	
Town		4904	_ 2taté	/





### POWER HYDRAULIC CONTROLS

lift and lower snow plows automatically!

Snow removal is easier, faster. more economical. See your dealer or write for illustrated folder.



### MONARCH ROAD MACHINERY

1331 Michigan St., N. E. Grand Repids 3, Michigan

## **MODEL CHANGEOVER SALE!** 1959 MODEL-BELOW COST!

BLADE TILTS-TABLE REMAINS LEVEL Heavy duty all cost Iron and steel construction. Precision ground cost from toble Price includes massive cost iron mitre gauge and patented motor drive that fits any motor Cross cuts, rips, hevels



thitres, dodoes, cuts compound angles - everything expected of saws costing faur times as much. Depth of cut adjustable; 0" to 2'4" — table always level. Send check or M.O. \$2.00 deposits on C.O.D.'s.

SPECIAL BARGAIN - This saw is our 1959 model. Each saw is brand new — sent to you in factory sealed cartons. Sold and guaranteed direct from the factory to you at a fontastic bargoin.

### FREE 10 DAY TRIAL --- MONEY BACK GUARANTEE

Try this famous saw 10 days. If you are not satisfied that It does the work of any tilt arbor saw, regardless of price, raturn for immediate money back refund.

Sunt Express Collect We reserve right to refund money if stock is exhausted

### AMERICAN MACHINE & TOOL CO. ROYERSFORD 34, PA.

All POPULAR SCIENCE DECEMBER 1959

## New Popular Science book shows you

How to Make Your Own

## **Built-Ins and** Space Savers

Here, at last, is the book that shows you how to expand your home by transforming unused space into compact, attractive living areas. Bill Baker, nationally known designer and furniture maker, brings you his original designs for 15 complete, space-saving projects. Step-by-step photos, hundreds of easyto-follow instructions, exploded views and diagrams make every project easy to build.

Shows you how to cut costs with inexpensive plywoods, how to finish them with modern wood trims, laminates, plastics, You'll learn cabinet makers' secrets, acquire knowhow about a wealth of techniques for indirect lighting, panelling, and much, much more!

Law-cost, Luxury Kitchen Hideaway Bar Home Theater Unit-TV, Hi-Fi, Radio Weman's Dream Sewing Center One-wall Complete Werkshop Tee Others 160 Pages 560 Stup-by-Step Photos?

Order your copies of How to Make Your Own Built-ins and Space Savers NOW on the



Popular Science Publishing 355 Lexington Ave., New York 17, N.Y.

copies of New to Make Your Own Builtins and Space Savers, at \$1.00 each. | enclose \$ \_\_\_\_\_ Books may be returned for prompt refund, if I'm not completely satisfied.

Hame	
Address	
City	*ZeneState



## Stop Buying Vitamins Blindly!

100 capsules Vitamin A (25,000 units) not \$1.75, but only 75c 106 tablets V tamin C (250 mg) not \$2.00 but only 85c 100 capsules Vitamin E (100 Int I Units) not \$4.65, but now reduced to only \$2.50. These are examples of over 150 FRESHLY PACKED. Gentanticed-potency vitatoms and health aids, available at savings of 60% and more? Send for FREE catalog and Vitamin Guide Book today. VITAMIN-QUOTA, Dept. T.748, 880 Broadway, New York 3, N. Y. or Dept. T.748, 11.5. S. Crenshaw Blyd., Los Angeles 19, Calif.

## FREE BOOK

THE LAW TRAINED

Write today for a FREE copy of illustrated lew book "THE LAW-THAINED MAN," which shows how to earn the professional Bucheler of Laws (LL B) degree through home study of the famous Blackstone Law Course All necessary books and lessons provided Moderate cost, convenient monthly torus. Write for FREE law training book soday

Blackstone School of Law, 307 M. Michigan Ave. Founded 1890 Dept. 129, Chicago 1, Illinois

## EARN GOOD MONEY

Up to 530 a day With a Universal Grinder

Have a business of your own in your garage of basement, sharpening laws mowers. Be your own boss, Small investment We furnish everything you need to start. Write FREE Dept. P-129 today for complete details FREE

ROGERS MANUFACTURING CO.

## **RUPTURE!**

An amazing Aic-Cushion Invention allows body freedom at work or play Light, next, coof, capitary Durable, cheap, Day and night pro-



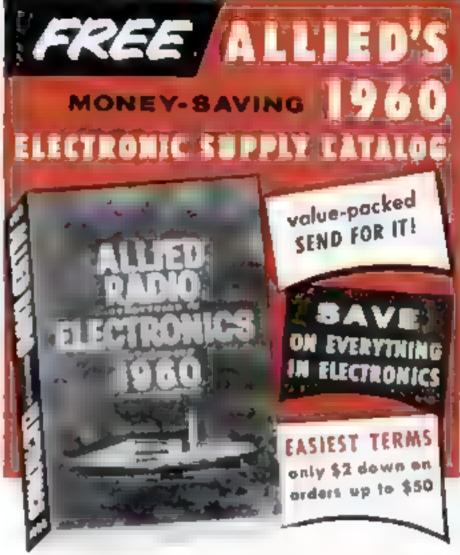
Durable, cheap. Day and night protection helps Nature support we kered muscles gently but sure y No risk Sent on Trial! Write NOW for free Broklet and Proof of Results. All correspondence confidential.

Brooks Company, 144-C State St., Marshall, Mich.

## MAKE BIG MONEY

OTHERS ARE MAKING FORTUNES— WHY NOT YOU? GET FREE DETAILS.

MAIN P O. BOX 1212-OAKLAND, CA	EIP.
Name	
Address.	
Ø9	State



## MORLD'S LARGEST STOCKS

Send for the most widely used buying guide to everything in Electronics of for Experimenters, Builders, Amateurs, Servicemen, Engineers and Hi-Fi enthusiasts. Save on:

- e KNIGHT-KITS\*-Best in Build-Your-Own
- e Everything to STEREO Hi-FI
- e Hi-Fi Music Systems and Components
- Topo Recordors & Phone Equipment
- a Public Address & Paging Systems
- . TV Tubus, Autonous, Accessories
- a America: Station Equipment
- a Latest Test & Lab Instruments
- o Parts, Tubes, Transisters
- o Everything in Tools & Technical Books

save on everything in Electronics at ALLIED get fastest service, expert personal help, guaranteed satisfaction. Send today for your FREE 1960 ALLIED Catalog.

Everything in Electronics from One Reliable Source

our 39th year



### PALLIEDSMADIO

ALLIED RADIO CORP., Dopt. 7-M9 100 M. Western Ave., Chicago 80, St.

I'l Rush FREE 1960 ALLIED Catalor.

Address

City Zone State



## EASY TO ASSEMBLE...COMPLETELY PORTABLE UP TO 500 HOURS ON BATTERIES

Fake at with some on trips to the beach, in a boat . . . Nothing to plug as a give and give an unspects so batteries. Lalls you to sleep, wakes you up, tells time and plays all day long Leather carrying case available. ONLY \$45.95.



#### **HEATH COMPANY**

Benton Harbor 15, Michigan

| \_\_\_\_\_ subsidiary of Devatrom, Inc.

Send the ratest Free Healthkit Catalog.

NAME

ADDRESS

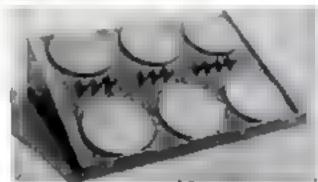
ZONE BLAS

Note: Price subject to change without not ca

## Kits for Christmas

## GENIAC COMPUTER KIT

You can construct over 12° d Terent circuits and machines that compute reason volve pluzzles and lemonstrate a wife variety of basic computer circuits with the GENIAC electric brain construction is to Over 30 J00 whom a colleges increating firms and private individuals have bought GENIACS since we first brought them on the market



GENIAC set up to do a problem in Space Ship Engineering

We have recently added a circuit for composing music which gives us special pleasure because it was designed by a 16 year old boy who learned about computers from his GENIAC. Dozons of other youngaters have created their own designs for computing circuits, used GENIACS in their school projects and established a solid foundation of information on computers with GENIAC'S

Each kit comes complete with Beginners Manual Study Guide. Instructions for building all the machines and circuits rack (exclusive with our GENIAC), parts tray, and our complete quest on answering service. When you buy a GENIAC you are buying a first course in computer operation

Each kit comes with a one week money back guarantee if you are not satisfied

Price of Kit complete with parts tray, rack, all components manuals and texts \$19.95 (postpaid in U.S., add 50c west of Mississippl) (\$2.00 outside United States.)

#### SCIENCE RESEARCH KITS, Inc., Dept. PS-129

Oliver Barffeld Company

108 E. 16th St

New York 3, N. Y.

Comparable with radios listing at \$75 without batteries!

## 8 TRANSISTOR "Jewei" POCKET RADIO

MADE IN \$29.95 INCLUDING DATTERIES



out of I provided there is the provided of the

Lasther Corrying Case—with snot lock and stordy leather strap — \$2.48 ppd Practision Private Europhone Attachment—\$1.95 ppd.

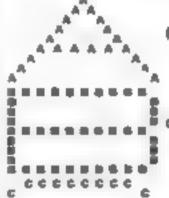
SCOTT MITCHELL HOUSE, INC. Dept H 21, 425 %. Renadway

Million Dollar Inventory — All Famous Brands

MAYINGS NEVER LESS THAN SOY, UP TO JOY, OFF REGULAR PRICES HEADQUARTERS FOR ALL SPORTS CAR THE SIZES SEND FOR YOUR FREE CATALOG!

RELIABLE TIRE - 730 MORGAN MUD.

FOR POSTERIOR HOUSERT K CHRISTANSFRRY Suggesta
FOR PARTER AND MORE EFFICIENT POSTAL SERVICE . . .
LEARN THE "A.B.C.'S" OF BOOD MAILING HABITS!



eccccccc

postal delivery zone number helps speed your most!

certain to include your return address on all letters and packages!

that the delivery address is correct and completel

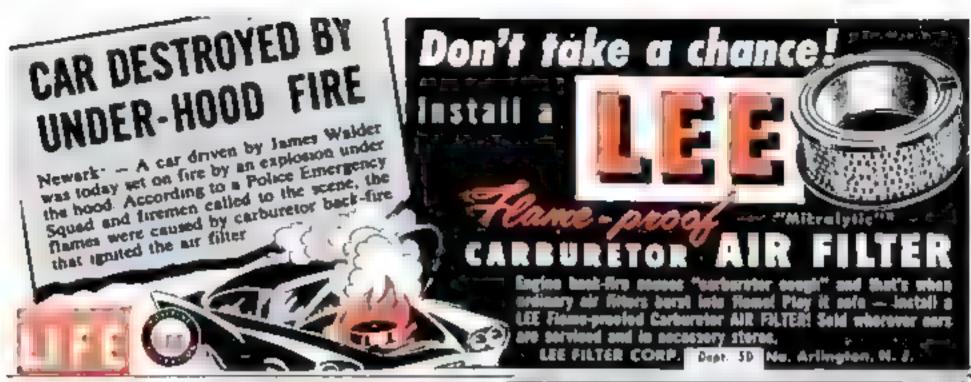
-AND-

MAIL EARLY IN THE DAY-IT'S THE BETTER WAY!



On you need more storage space? Everybody does, and most people have an aftic with no starway. This unique, compact aftic stair makes your aftic readily and handily accessible through your regular trapdoor. Give yourself more living room—store those seldom-used items. No installation necessary. Hooks over top of trapdoor and ralls up nearly against trapdoor when not in use. Lightweight, strong, ceiling length, ready for use at the flip of the cord. Satisfaction Graranteed, Send \$6.95 to.

S & R RESEARCH, Box A-1 6. San Gabriel, California



# LEARN WHILE SLEEP!



Experiment in this fuscinating educational new field. Use your phono, recorder or amating new Electronic Educator endless tape recorder Free catalog lists over 200 unusual tapes, records, equipment for steep learning & hypnosis experimenters. Sleep Learning Research Assin, Box 23 N. Olympia, Wash,

## FLECTRIFY - PLAYER PIANOS

YOU CAN QUICKLY END TIRESOME FOOT-PUMPING With a Compact Low-Cost Lee Silent Section Unit



EASY TO INSTALL
FULLY GUARANTEED
1000'S IN USE

LEE MUSIC MFG. CO. Box 595, Tujunga, Calif



The Gem Maker comes complete with all necessary equipment in lucing a super chart distributed index for easing an all the wheels grindling shaping and pinch on also complete equipment as shoteen (mater and belt for only \$126.60, find, \$144 ng on, Wilstinsh Write to day for information and literature.

141 MANUFACTURING CO.

Doot, S. Burlington, Wis.



My nobile from 11 to 61 nears

# YOU CAN HAVE A NEW BODY AT ANY AGE ...

with New Health—New Strength!

New of foil wou can quickly and

easily GAIN pounds of solid muscle—

or REDUCE unight, dangerous fot

Build a Super Philosophia with POWER

flux shapely muscles OR with keep fill

and healthy in top condition

Billy Van suys:

"ALL YOU WEED IS A ROPE!"

My amazing at out he discovery ROPERE SE Gua out & R suns

BILLY VAN PHYSICAL DIRECTOR

4834 Art St.

Studio 2

San Diego 15, California



Not everyone does as well, but T.N COBY, who started a business of his own, reports...

for 12 months I've averaged

\$800 per month income

- most of it clear profit for me i

Many men have discovered how to be independent, to be free of layoffs and bosses. C. G. Naples growed more than \$200 his first week. A father-son combination grossed \$44,000 their second year. H. Lemon says, "I neited \$133 in one 8-hour day."

How much you make depends largely on you. You need no special skill, no large investment. Start part time if you wish.

MO SHOP MICESSARY a Our Electric Detarger shampoos rugs, carpets right on floor—removes dirt and grime and helps to show their natural polor sud beauty. So efficient and safe it is used by largest restronds and hotels.

This is not a toose proposition,
You own the machine, you work
when and where you please and all
the money you take in is your own.
No risk Machines fully guaranteed

VON SCHRADER MFS. CO., W11 "R" Pl., Recine, Wis.

Without obligation send me PREE booklet about your RUG DETERGER and tell me how I can start my own permanant, profitable business.

Home	
Address	
City	ZoneState



Complete Catalog featuring The dest Values it telesèle

LEADERS IN MI-FI

OUR

39th

The most complete electronic supply catalog crammed full of everything electronic at our customary down-toearth money-neving prices.

HEAPLY & CANEAU

a Tape Recenters a Public Abbatts.

STETTER & AMETERS EQUIPMENT

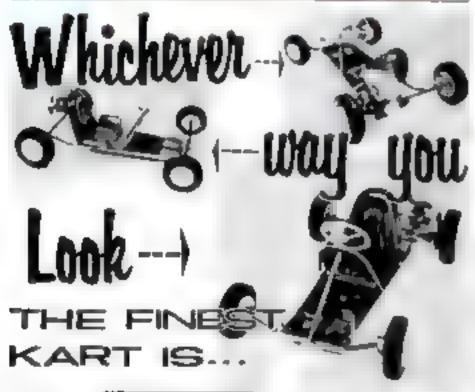
O PROSTRAL SEPPLIES O SPECIO A TV TUBEL AND PRATE O SESTEMBERTS

M TELEBOOPER GROUPSLASS, MICHO-

The largest selection of hi-fl comon Lafayette endorsed "best-buy" complete systems.

EASY PAY TERMS AVAILABLE -





The home Go Kart to a rea-General By the products of the Lo Karl Manufacturing to low and to not to be conformed with 2) those of all instators

The pacesetter in the karting sport is the original Go Kart, still tops in popularity, quality and performance. A favorite with the sports-minded hobbyist, a complete, worked kit is only \$148.00. We will crute and ship anywhere in the U.S. for only \$10. For the home builder anxious to use those new Christmas tools, complete blueprints and specifications are just \$3.95, 5end 25¢ for postage and handling to get our award winning color brochure—or if you can't wait, arder your genuine Go Kart now. Send \$25.—bolonce C.O.D.

MANUFACTURING COMPANY, INC. 6317 Irwindale, Asses, California

"FASCIMATING" says NEWSWEEK



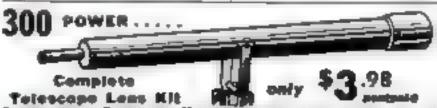
#### AUTOBIOGRAPHY OF A YOGI

BY PARAMAHANSA YOGANANDA

Tam grateful to you for granting me some insight into this fascinating world."-Thomas Mann, Nobel prizemen \$4.00

BELF-REALIZATION FELLOWSHIP Publishers, Los Angeles

AT YOUR LOCAL BOOKSTORE



Computer Space, Explore the Universe, Planets, Moon Craters, New Stace, etc. Complete Length; today at of the net found tength prograd and put shed abjective was expressed tensor for in 1998 14, 100 (2018); a 12 1998 14, 200 2208 18, 250 5238 18, 200 1998 14, and at become y pens fittings, Easy to make from simple step his step just cartings. Teljaid and maked not feet uded. I Menny back granuage.

BUSSE SALES CO., Hortford, Conn., Dept. PS-82





## **GOVERNMENT OIL LEASES** LOW AS \$1 PER ACRE.

You do no drilling, pay no taxes, may realize a king-size profit without ever leaving home. Write for free map and literature.

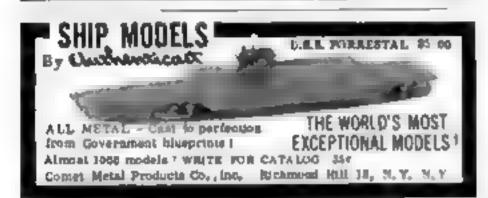
AMERICAN OIL SCOUTS, Dept. PS \$350 Santa Monica Bivd. Let Angeles 46, Calif

On Dec. 10th of each year since 1952, UNITED NATIONS has issued 3 stamps to commemorate the dedication of Human Rights all over the world, (A couple of these sets have already reached the \$10, level and keep rising in value). For only 50s we will send you 2 different beautifully engraved envelopes posted on the first DAY OF ISSUE of the two 1959 HUMAN RIGHTS stamps. For another \$1.50 you can have the six other FIRST DAY COVERS of the three earlier 1959 U.N. issues. Money back if not completely satisfied—ask for lists of other First Day and First JET FLIGHT covers.

K. M. WALSH TUCKAHOE, New York Box 305-M











# WANT A BETTER JOB? BECOME AN

DNLY 32 MONTHS TO EARN A BACHELOR OF SCIENCE DEGREE IN ELECTRONIC ENGINEERING

Class entos ment limited to allow for individual instruction (hortered by State of California Nonprobi non-sectorian coed-neations) - estate shed 31 years. Either day or even or classes

APPROVED FOR VETS—ENROLL MOW!

PACIF	1C 5. 1	STA'	TES orn	DHIT Ave	Los	TY,	Dept.	128 Galif.	
Please	send	your	PRI	IN CA	TALOO	ŀ			
Hame.	+	,							***

Address

# MEN PAST 40

## Afflicted With Bladder Trouble, Pains in Back, Hips, Legs, Nervousness, Tiredness.

If you are a victim of these symptoms, your trouble may be due to Glandular Inflammation. A constitutional Disease that requires special types of medical treatment. Neglect of such Inflammation causes men to grow old prematurely and before their time

Most men, if treatment is taken in time, can be successfully NON-SURGICALLY treated for Glandular Inflammation. If the condition is aggravated by lack of treatment, surgery may be the only chance.

## NON-SURGICAL TREATMENTS

The NON-SURGICAL New Type treatments used at the Excelsion Medical Clinic are the result of discoveries in recent years of new techniques and drugs, plus over 20 years research by scientific technologists and doctors

Men from all walks of life and from over 1,000 communities have been successfully treated here at Excelsion Springs. They found soothing and comforting relief and new health in life

### EXAMINATION AT LOW COST

When you arrive, our Doctors, who are experienced specialists, make it complete examination. You then decide if you will take the treatments needed. which are so mild, hospitalization is not needed a considerable saving in

#### RECTAL-COLON

Are often associated with Elandular inflammation, These disorders, we can successfully treat for you, at the same time we treat Elandular inflammation.

#### REDUCIBLE HERNIA

to also amenable to a painless Mon-Surgical treatment that we have developed. Full dotalls of this treatment given in our Free Back.

### Write For FREE BOOK

The Excelsion Medical Clinic has published a New FREE Blook that deals with diseases peculiar to men. It could prove of utmost importance to your fature life Write today northwestern.

EXCELSIOR
MEDICAL CLINIC
Dept. 86250
Excelsior Springs, Mo.
Gentlemen: Kindly :
New FREE Book, I



information, (Please	Check Box)	
☐ Glandular	☐ Heroia	
Inflammation	Rectal-Colon	
Name		
Alteres		
CRy.	Sitte	٠



Classified Ads only \$1.15 per word insertion, payable in edvance. Minimum ad 10 words. To be included in February issue, copy should be in our office by December 20. He conceilations accepted after December 21, Address orders to O. K. Kelly, Classified Adv. Mgr.

#### AUTOMOBILES & MIDDLET CARS

ĸ.

1859 CATALOG on Parts Eits for Golf Buggy or Jr Sports Car 25c Indus Cor-poration, 1915 Madeson, Induspassits.

CROSLEY or Foreign car parts esta-logue Parts discount club, Box 7, Elmont, New York

OLD Car Magazine Prec Sample Franson a Motor News, Bux 1568, San Diego 12 California

NON-PROFIT organization offers automobile hterature old modern and forcia i denier broks, service manusis glossy photographs free motor magazis es Write immediately get on free mailing list. Auto Manusca, Inc., Stock-bridge, Mich

AUTOMOBILE books, All types, List free, Kennedy Publishing, Box 221, New York 16, N. V.

#### AUTO SUPPLIES A EQUIPMENT

HAVE money on Jeep and aimy truck parts Large inventory Cotalogs for Jeep and C M C. owners. American Auto Parts Co., 1830-P6 Locust, Kannas City, Misecuri.

CIANT Auto Parts Cutalog Thousands ape tol accessories about power per-fermation M seage on term equipment Bend 25c (relicadas e) Newhouse Automotive Industries, 5865-PS-12 Beverly, Los Amacles 22. Calif.

1980 EDITION. It a New! It's different' thet world a largest auto accessories and parts catalog, save up to 50% 388 pages over 100,000 items, carlest to 1950 m atels, including Hollywood accessories, custom as the and Hi Speed Equipment All parts and accessories for all cars, trucks foreign and sports cars. We have that hard to get part. Jam packed with bar-gains Completely illightrated. Send 25c orginndable; J. C. Whitney, 1919 PS-12 Archer Chicago 16, 1h

AUTO shop weiding repair training in world a largest non-profit school. Low tuition. Free booklet. Hobert Welders, Box P-1291 Troy, Ohio.

1809 1934 FORD Parts. It strated catalogue 50r Mark Auto Laston New Jersey.

BATTERY Additive plus Polic, 15 Wars to save Cas. Repair bills. \$1 00. Capper soli, 237 Fourth, Jersey City 2, New Jersey

PLASTIC Lead reputra rust holes dents customizes. Size equal to six pounds lead \$2. International Plastics. Orand Rapids 4 Michigan PLASTIC

SIRENS Air Borns, Lights' Catalog 10c McCanna Company Tage town N Y

RING Valve Job while driving Only \$1 00 delivered. World a only intented product of its kind. Lachage es Over million new repeat sales fourteen mortesatu, vents. More back suarantee. Free information. Joe Dilton National Distributor Box 321 C Bridgeport Ohio

'RING-Valve Job" while driving, \$6 00 postpaid. Owaranteed!! 19th successful year 1 Yellow Cab test-proven. Motaloy, Grantham 27, Penna.

### USE THIS HANDY INDEX TO FIND WHAT YOU WANT

trivertising transfer for Advertisors to it was it for a Indian Goods to its it they be to be the transfer of the state of Antoninaud -Auto Tra era to diobles & Milest Curs A Martiner

Busto chatheard Motors But to Bus de l'en en d'un diten. Etc Busto a Me au ner Busto en traccionation Name Busto en Bernice follormation Name Buy ft Wholesnie

Famera - Photo Supplies

fa 'o' had unnot & Tenis

Last wo up 'Store Pareling | Salk Talks

total & Furre | v

rotte Photo Finishing | .

Petertires De la Coutself Desta Bleifs Hamstern & Pots

S. combession.

Francistional & Instruction For nearthy 2 and an Equipment For nearthy 2 and an Engines Motors (2):

Farms Ciber Rept Freate For Insert of Transpus For Tax Wince Interpus Formulas Plans Pic Tr vectores

Uniter Counters Treasure Finders

Help Wanted Records If he to them to the terms to the transfer the featherman Headort Lynn

Investigan, Wanted

John Cames Schulttes Etc

Lancauge Ospita Live Hall Laurine Hy Mat.

Mach nees. Food Supplier Die Ma. r. Tacks. Para es. Die M. ra. s. & Pres. mr. Stettes omen of the standard of the st

Of Intree-L To Women Old Gold Jews ry W. Wasches.

Lerenbal Property Photocopies Etc. Property Management Etc. Property Management Etc. Property Street Property Companions

Ratio IV Supplies & Configurent H = H des States B = 1 by Seet or Butber Stamps & Office Supplies

Science & Chemistry S on the leads to the Fishing Tacking Stampy Collecting

Tattening Supplies Tel Tr Typewriters & Office Machines

Wan ed to Buy Wate: Rept 127 Wate 2 Votatel Welding Soldering

TOILET Paper Oil Filter Adapter, \$3.50 Zepco, Box 3461, Los Angeles \$4. Celifornia.

#### AUTO TRAILERS

BUILD Expanding eight foot trailer Accommodates five. Literature for Fra-Mar Company, Wilmington Massachusetts.

CAMP Trailer—collaps/ble sleeps platts specifications, \$1 00. Musraug Box 74. Beilies, Conn

#### MOTORCYCLES, BICYCLES AND SUPPLIES

8

11

ST

30

海田本

334

46

47

0.5

11

42

10

Į P

71

70

77

24

41

45

PLO H

7,00

23

0.7

nn.

32

54

文的

D 4 33

77

7.1

204

RECONDITIONED Motorcycle Motors Chrome accessories Complete stock In-d an parts Expert rebuilding Past service in Ban Motorcycle Sales, Kansas City 27 M samuri

MIDGET races \$13 motorscootes \$6. less engines Gocart engine \$6 Chek mo-tograms \$25 James \$45 Four wheel drive Crossey truck \$185 (Mail order only) Send 25c J5c for First Class ma the) for Di-rectors Cata ogus Number \$7 listing these and hundreds of other bargains home-builders parts plans etc Midget Motors Directory Achena Ohio

EUROPEAN Motorscooters Motorcycles. Newest 1900 Catalog 25c. Motorcycle Im-port Corp. 505 B Fifth Ave., New York 17.

#### AVIATION

BUILDING your own high performance sport plane is easy with our new simplified blueprints and detailed instructions No expensence required. Four economical models one two passenger serobatics For complete details, brochures photographs I views. FAA regulations on homebuilt arritance Mail \$1.00 (postal packaging expense) to St ta Aircraft, Box 10448
Riverside Cabforms

AIR Sled Plans. 7 views, photos \$5.00 Aeromobile. Nepomest, Illinois.

HOMFBUILT Helicopter Mandbook Homebuilt Belicopter Directory Home-built Airplane Directory \$1.00 Zach Urshan Box 4333 N.P., Baz Diego 4. CHA-OFDIR

RAMJET Helicopter build inexpensively Plans only \$1.00 Wooster Engineering, Box 258 N Wooster Ohio

PROPELLERS, plans, supplies for airbonts and snowplanes Latest designs, prompt delivery Catalog 25c Banks-Maxwell Box 3301O. Ft Worth 5. Texas

PLYING Platform Three Draw tigs \$2.00 Rotron Box 573-N Bel-flower Calif HELICOPTER, Kita, Plans. Free Bro-churs. Adams. Box 8043-N Lakewood, Calif

DUCTED fan design. Used in Air Slede and flying pistforms. Specifications and 4 pages of drawings, \$2.00, Type-Turbine, Box 11253, Phoenix, Arizona.

#### **ASTRONAUTICS**

ORAVITY latest undisclosed theories and information \$1.00. G. and P Research Lab Box 574. Bristol. Tennessee

#### ELECTRICAL SI PPILIES \* EQUIPMENT

BOOK 200 Electric Stunts \$1 00. Cuttingson, \$75 Arastradero, Los Altos, Cull-

46 POPULAR SCIENCE DECEMBER 1959

WHOLESALE Appliance Parts catalogue 25c, 1 001 Items—Elements to tools, Seco. 26 South 20th Street, Birmingham 3, Alabama.

LAMP parts. Wholesale. Thousands of steins for repairing converting Caraing 25. Bruwn Lamp, Box 305-D, Claylon 5, Missouri

ELECTRICIANS! Bend conduit and ) correctly Latest "Simplified System" \$3.06. William Goforth, Box 455A, Clarks-ville, Tenn.

#### WELDING, SOLDERING

WELDERS. 110-220. Weids 34" 438 50 Morris, 1070 Inner Drive, Schenectady New York

ELECTRIC Arc Welders—four sixes, Lorson Electric, Inc., Rope, Kansas

#### MACHINERY, TOOL SUPPLIES, ETC.

DRILLS and Reamers High Speed Used this New; 12 drills or Reamers La" to 1" diameter \$15.00. 505.000 pc. Drills, ream- ers. Taps. Straight Shatik Carbide tipped lawis. 5.00 per .b Pus Pos and Postal Surveys. 710 N Wells, Chicago 10. Illanois

TOOL Hargains Save to 80 H.B. Curters \$3.50 Dizen. Sample and Caraing \$7.00 List 10: Same Enterprises 40 Greenday Avenue Wignester & Mass.

El KCTRIC Dr ., O' ndut, Carular Pres-Tos., Sa comen Dearest Wanted, Travia Too Company Sidney, Jowa

NFW deals machinist tools Write Campbell Tools Co. 1424 Barcley Springfield, Olivo

#### DA TRIGONOMETERS

ENGINEERS, Draftsmen Sugenta Trianguator Makes Trig symmetry Fac-\$1.25 No C O D Trichs, Moz 67 Buffato 15 New York

#### 10 ENGINES, MOTORS, ETC.

DIESEL Injector Parts and Puet Pumps | Was rd | Mai 32 71 1 0 Mayer 7130 Carnogie, Cleveland 3, Ohio.

REWIND M stora Yourse & Complete In structions \$1.00. Limits Mile Museu in Mile again

MOTOR restricting supplies in that tions, ca alog blodern Box 8758 Entires 4, in 14 Mo.

MOTORS | H P Genera Electric 67:30 | H P Wag er 1.4:30 Send M O Rebuilt sizes to 5 H P List 10c A. C Motors, 3101 N 22nd St., Philadelphia 32. Pennsylvania.

#### II BOATS, OUTBOARD MOTORS

NEW used rebuilt marine motors Marice conversions, fittings, Free Catalog Scokes Marine Supply Dept. 23, Coldwater, Mich.

PULL are cut to shape Boat patterns blueprints for the feet But new 10 pm. shape when the many of Nava ar Proceed the grand Crussers. Ramabou a Re Re Coubboard Boats Saurag Ramag Ramag Houseboats for How to Build a Boat Book et \$2.50 Mardance & E., men Caratog \$2.00 Car e and Boat Hang to Dept A-77 Boa 1654 Curveland Ohio.

BOAT Plans—Full Size Patterns—Frame R : Modern Inboards and On boards ? ? amateur builders. Complete New Catalog 50c or specify requirements. Gien Marine \$152 Rosecrans, Helldower, Ca 1

SAVE Money New, used outboard motor parts Sero wat a Sump up, recuted Outboard Motor Mart, 220 M State Busson C. Many

Others, Lists 25c. Done Motors, Mount

SAVE Save Save Wirld's Pinest Boat K a 25 cless Naturfact on Gustanierd W to for five cubir calalog Dept Policy 1258 Taff Ma he Woods att 636 18th Ave N K Minnespula Mainteota

300 BOAT Plans Patterns, Catalog 50c Modern Trader Katal Marinograft, Box 151-P. Brighton, Mass

KIT Boats in molded Piberglass or preassembled plywood, 50 Guaranteed models, \$41 75 up. treight paid, easy terms. Free catalog includes hardware, fiberglass supplies trailers. Luger Boats, Dept. K-II, Minneapoils 20. Minnesota

POLDING Boats Imported Unsinkshie 3 models, Sail, paddle, motor bust Fire cutalog MI Pioneer Posting Boats, 205 East 66 Street, New York

#### 12 BODY-RUILDING COURSES, JIL JITSU & ATHLETIC EQUIPMENT

BUILD powerful arms, chest, shoulders' 22 exercises, \$1 Found. Box 801-C, 1200 Market Wilmington 80 Decamare

HIG Strong Healthy Muscles 4 Courses only 25c, 12 Courses 42 00. Health Wisdom Courses 41 00 Personal Supervision, Agents Wanted Results fully Guaranteed, 8:d's System. PS 2, Southgate, California

PRES Muscle building information not one. Box 638A, North Mami Florida

DEADLY Orien a Fighting Arts—Elemental Kainte Kains Pu I intrated Manual 53 85 Oriental Bunk Sales P. O. Box. 1981 Oak and T. Cabi.

BARBELLS Exercise Equipment, Bookiet, Realth, Strongth, Physique or Reading Barbelt Co., Reading, Ponnsyl-,

PUSHED around? Don't take nonsense from builtes. Surprise them, East with you know Police Jiu Jitan. Complete indy illustrated course in one votume as taught police and armed forces. Send \$1 now Satisfaction guaranteed. Books Publishing Co. Amityville 29, New York

#### TANDERMY

FREE Book Tells flow You Can Learn Taxberins and Taxeling Fatelinaing, problems Robbe Send Posts! No Obligation State Age Northwestern School Dept 20 J Omaha 2 Nebr

## FIELD OF ASSEST

DYNASCOPE-Amering world famous 177
reflectes believe because tree broat are
Criterion, Dept. DS-87 Hartford, Coun.

PHEF Calabrain Thousands was surplus optical bargains Legist Prisms Telescopes H in the a str per t \$1 to cr 10 Lets Hibbrait Set and Prises ( backlet II Jacques 49 West Merrick Hand, Lynbrick New York

BINOCULARS, Telescopes, Marriacopes Ter or values \$3 95 up Request I ee mones saving catalog, Criterion, Dept 5 to Hart and Conn.

WAR Surplus bargains! Milions of laness, instruments, telescopes binneulars, companies to and companies I, so of actromose can seem up I aim World a grounded option market place. Send noir \$1.0 for beginners a please Elt and by man united brokers Stock 2 CN Write for catalog-CN Free Economic Sciences Co, Barrington, New Jersey.

Build your own Reflector Televiness Complete has Militar beginned Internahis Art Authors a Request free as traced termine (in a on Mathematicining De R. K.) 50 Hart of Coun

TE ESCOPES in all bittory are put remained in exercise Fire rations National Option Company and New York Avenue Loing Com Removement

AWAZ has press presson innocuser Free Burnaut besetting rateous free Denema and write Premiss Impactors. Mercury Bidg. West Los Angeles 25 Calif

REFLECTING Telescope completely acsembled 50X Guarat seed Obsertator care ness her rights in The Skirov et Co., P. O. Box 55. Brooklyn 28. New York

TELESCOPES—refractor, reflector, lats and accessor of Five Instructed booklet. Del. Optics Co. Lie ited. Dept. PS. 329—55th Street West Bow York New Jerse.

REPLECTOR Telescope Kits direct from factors. From \$7.5 Caher official do it soursell kits. Pres buokiet. Esco Products Ouknings. New Jesse.

REFLECTOR Telescope Mayors Made guaranteed Henderson SEI W Aduras Taggett, Arat

STAR-Atlases, astronomica, books, free list. Herbert Luft. 60-11 22Pth St., Plushing 64, N. Y.

TELESCOPES benetulars microscopes all sizes. Complete telescope kils, parts accessories. Free illustrated catalog Sufiolk Science, Mattituck, New York.

#### 15 SPORTING GOODS, GUNS, PLANTAGE TACKLE, ARCHERY, TRAPPING

100 000 PRODUCTS Who.esate - Free rate on Send postcard Econ-O-Mart, Whippany 16, New Jerses

FIGER With case Calaing Beach Spaters Late pairs Stoker midd Jan Rees F a sports (PE) Infect 6 Orgo

6-SHOT Cot Hesover 22 Cal Short Ammarition No bank \$1250 POS. Che 44: Impot Assertates Dept PSS, 185 N Website Charge 1 Ri

10,000 GUNS II - Antiques. Moderns Swords. Armour-every description. Giant Catalog 81 00. Agramonte s. Youkers 2-A. M Y

MOLDS for Fisherman a Sinkers, Jigs. Squids Casting and Spinning Lures. Free Catalogue Sweet a Moids. Tonawanda 3, New York

SHAKESPEARE reel No. 1774 \$10.47 Postpaid. Tackle, Box 26, Hutchinson, Karsas.

5 000 BARGAINS, firearms, binoculars was read to a con 50. Builth Museum, is mornede N

Prices of Health W. T. C. Rename SAVE: Gun & Tackle 109 Page Discount

Catalog. Unusual and famous brands. Send 2be to Klein's, Chicago 24.

JAP refer after to American sheets
16 ft Jap att a 25 to call to TP
Such West Branch 10, Michigan

## A CAMPING EQUIPMENT

CAMPING Equipment the most unusual, magina are part to a Christian principle of Catagoria Print name-audiesa Miran 10-503 Soc Are or Languages di 1 New York

#### 17 DOGS, BIRDS, HAVISTERS, HABBITS & PLAN

RAINT Rabbits Make Money Into matable Processed free Way e M Jointson, 613, Kansan City 61 Missourt

EARN \$10,000 Yearly Raising Angora Rabbit Wool for us, information 25c Coin American Angora Company, Malta 1, Montana

Balez Pabbt - on 1500 month plan Free details. White s Rabbitry, Delaware, Ohio.

#### BANK WAIT

PRES Literaria e Big mobes raising Schworth and Rets We ten or vot his so to rate and sell Schwart Toda H b d red wag res 2000 \$505 5000 \$605 10.000—\$10.00. Postpaid, with raising and marketing standard toda Larger Farm-12. Plains Georgia

## 9 FARMS, OTHER REAL PRIVATE.

PLONIDA Mice homesites, \$145 at \$16 monthly Folder Free. Wantree Vernor, DeLand. Florida

CENTRAL Florida Developments. Trainer Homesites, also Lateiront and Highway Lots. Acreage No interest. From 2203 bg. Terms. Victor Roepks. DeLand Florida.

STHEIL T Ca and Free 3 40 Baiga na deu bed 36 Safes Count to Cast Farms Hottes Busic set Winda Largers 59 Year being broad Ready, 251 ZB 4th Ava., New York 10, N. Y.

FLORIDA—Beautiful, wooded homesites \$290—\$10 monthly Pree literature. Douglas Wood, Pountain, Plorida

LOVISIANA land—Buangu or residential, Sportsman Paradise, E. Bondurant, Box 265 W et et Louisiana.

CANADIAN Vacation Lands Full Price \$184.00, For 10 Acres, \$10.00 Month Sultable Cottage Sites. Hunting Fishing Camps Fee Information Land Corporate 110 Residenbury Downsview Ontario Canada

#### 22 PROFITABLE OCCUPATIONS

\$5000 FROM Half Acre growing Consenserop bought Particulars by Associated Growers, Sperling Manitobs.

PREE Picture Polder, "How to Make 2) 000 Yearly Sparetime Backyard, Raising Earthworms?" Oakhavan-T, Cedar Hill, Texas.

OPERATE Collection Agency. "Gold Mine" opportunity Lifetime business. Be respected Frankin Credit Roanoks, Virginia

VENDING Machines—No Seding Operate A Route of C. it Machines and Earn Amazing Profits 32 Page Catalog Free Parkway Machine Co position, Dept. 17-718 Ednor S. cet. Baltim de 2. Marjuand

INVESTIGATE Accidents—Earn \$125 week to start. Claim investigators are ungerty freehed to observe as a more than 480 000 accidents daily Work full time for invarance community is read steamed to four own problems against time business. No experience needed Free back North Investigation Schools B-12. But \$203. Decima 5. Texas

FREE Literature -- Make Big Money Raising Fishworms and Crickets. Carter Farm-10. Plains. Ga.

LEARN Plane tuning at home. Pres infermation, American School Plane Tuning, Box 707, Othroy, Calif

BECOME Independent with your own franchise business. Thousands earning handsome incomes, Request interesting facts today National Franchise Reports. P6-528 373 North Michigan, Chicago 1.

#### 3 BOOKS & MAGAZINES

GOOD Used Books, \$50c-\$1 Pres Lists Editions. Dept PS, Hempstead, New York UHITISH Book Barns as Any subject Catalog free Transtooks Box 1-PT Warringh N Y

HANDLE School, none 40 Magazines Special Offers (Lord Commissions, Cassell Agency Born on Beach Schools

PHOPHET Ettah Coming Before Christ" Wonderful Book Free, 50 Megadio Massion Rochester 19 New York

"THE Plottes Digest \$2 about For depunch mari tent estate an all bundiese opportuit les tanés over 100 c.f.es deact bed Lesia Mircha Box 818, Brooks-Tille Plottes

ATHEIST Books Ca alogue free Truth Seeker C. 38 Park Row New York &

SCIENCE Parties Book Bargains List 10c Werewolf Soukshop Veroisa I, Penn- , 05:V85:a

BOYSE Traders Manur ne 15c Person cast 6378 P Windsor Lane, San Jose 26 California

Disposal 4 Amazing Booksets 30c Interesting Literature Samples 30c Pernil 436 N Y Ave Brook r 25 N Y 1000 HOW-to-Books, Catalog 25 renta Arteraft, Baldwin, Marriand

BOOKHUNTERS: All Subjects. Send Wantel Jaher Book Service, 143 Raseswood Drive, Westbury, New York

BIG Value, Low Price! New books. List -10c. Joby Books. Box 31, Vanderveer, Brooklyn 10 N Y

1.000 000 BOOKS-10c Each! Every subsect tatables done Mailway Box 13t PB Mil vesant NYC-E

cover 1300 inte estant Books Pres Cat-

SELF here books all subjects. Free catning Box :02 B Providence R. I.

MAGAZINE Subscriptions Perfect Gift for Everyone Pres Discount Catalogue write Subscription Mart, Dept. PS, 3112 Jerome Ave., N Y C. 68

#### 34 HYPNOTISM

HYPNOTIZE Self Others ub is as eep, with amusing hypnotic phonograph records tapes Catalog free Research Association, Box 24-G Olympia, Washington

FREE litustrated Hypnotism. Beiftypnosis Catalogus. Write Hypnotist, 2721 Bunsel, Hollywood 48P, California

FREE Catalog! Hyphotism Autohypnoels Hooks Tapes. Records! Drawer PS607 Ruidoso New Mexico

XRAY Mindi Hypnotise, one glance Guaranteed \$3.00. Wamsteker, Box 10. Ottery, Cape, South Africa.

48 POPULAR SCIENCE DECEMBER 1959

HYPROTISM: Actorogention, Guaranteed home study courses. Diploma issued Free bruchure School Applied H. molegy Dept. Bi2-200 West 57th Screet. New York 19. N. Y.

EARM BR MS Ph D degrees in Payrheady with Hopmaniam major correspond once \$185 teams Tanny College 115 Bankers Trust Building, Indianapolis 4. Indiana.

INVENTION plastic Rypno-Com has whiching hypnotic lens Complete with secrets instructions only Mr. Success or Miles Back. Free catalog records books machines emissed Hiptoric Alds 12-PS. 1113 B. nadway New York City 10

HYPWOTIZE One wird One fingershap on Mage Batislact in or related \$2 Hypnomiater Hos \$100.66 Chinage \$0

HYPNOTIZE Suc easily s. One World In artunes of Against Wi. Meriada Eageard Course Inc. d.og. Sec. et Nerva Pressure Technique \$1.00 Arthur French 606 Broad Workbur, New Jr. Sec.

TELEPATRY'I Hyprotise' Ministed Textbook \$2.00 Minter, Box 264, Cedarbu a Wiscommit

HYPMOTIZE unnoticed, quickly-effortlessly or refund) \$100. Minter, Box 344 Cecarbory, Wisconsin

#### 14A JOKES, GAMES, NOVELTIES, ETC.

3100 NOVELTIES, Jokes, tricks, gadgets, fnow sters hobbles Bg catalog for Jonason Smith D 407 Decree 7

ONE Thousand Tri he Jokers Stants Magte, Brasses Passes Justice Colored (180 Pages) Rush 25c Pres trick given House of 1800 Mysteries, 200 82 Passes out. Trumbuil, Copp.

#### 5 MAGIC TRICKS, PLEZIES, ETC.

WORLD & Buest professional marker Julier movelties count illustrated catalog | 10c Top Hat Evanston 11 Identify

WIN Di e Carta, Ca sing alle Book Book Box 671 St Louis I Missouri

500 TRICES Paterias famous 130 page fallong now available just 10c. Parest service to magaziants everywhere with lateral in image for parest stage pocket Send 10c today abugins Magaziand, Dept. 17 Decisi Tetas.

3000 TRICKS parket parior stage We id a Pinest Mark Catalog 1508 pages \$2.50 Manter s. S 1311 Walnut Philade.phia 7

MAGIC catalogue 25c Eagle magic 113 South Third Avenue Minneapolis 3, Mintroots.

#### COINS & CURRENCY

SPECIAL \$1.00 Seven different Indian Fennies, Album, 20-page Bargain Catalog Hobby Sales, Box 4054, St. Pagl 16, Minu.

NUMISMATIC B Largest Newspaper Semi Mobility Sample 25 52 00 Yearth Numismatic News, Washington Street, Ioa Wisconen

COINS from Formosa, Vatican, etc. plus foreign banknote, 10c with coin approvals Littleton Coin Company, Littleton 82 New Hampshire

INDIAN Cent. Poreign Coin. Bargain Lists, Ail 15c. Butchinson's, Box 4747 Philadelphia M. Penna

Money-Mc. John. Roshin Heights. N. Y.

COIN Magezine. 200 pages. Sample 40c Numismatic, 7320 Milwaukes, Chicago 31 FREE List! U.S. Coins, Lowest Prices, Hugh's Coins, Hickory, North Carolina

EIGHT Different Indian Cente \$1.00 Collector's Bargains, Box 356A, New Hope, Person

RANKST CC Mint Doits (485 Unc 46 00 100 Pg Hustrated Catalogue 50c Shuits, Salt Lake City 10, Utah

FIGHTEEN Different Indianhead Cents #7.00 Bargain Lists Free, Sayers, 1908 Loaks Johnson City, Tennessee.

LINCOLNS 25 a fferent \$1.00 Kolns. 1930 E. Kinkaid. Wich to 18 Kanean

LINCOLNS 25 Different, 1909-1934, 91 50. DeWolf, 2041 Munchester Cardiff, Cautorn a

COMPLETE U.S. Cots lost '0c Re'undable). Bonus offer included! Economy Sales, 156-C Dean, Manafield, Massachusetts.

HARGAINS-\$20.00 Gold \$43.85, \$10.00 Gold \$22.95, \$5.00 Gold \$12.45. Glittering Lucite Cube "Paper Weight" with encased \$157 (or \$150) Proof Set \$9.75 Books-World Coins \$4.00; Canadian \$1.50 U.S. Guidebook \$1.75 Bebee's, \$514 North 30th, Omaha 11 Nebraska.

INDIAN Cent With Price List isc. Rail Coins. Deinbed, New Jersey

I INCOLN Cents 1823 S 1824-8 182, 5, 1835 S 5 1844 D 18 8 8 B 1848 S D 1848

US com list 10c Contains over 100 delor attors over \$ 200 de abidal barratja Stoney, 260 Washington Bos on 6 Mass

THICES Braitiant Uncirculated Mexican Silver Dollars \$1 00. Universal Services, Box 475, San Antonio \$-A12, Texas,

SIXTEEN page price list of USA and Canad an coins free. Selling prices on thousands of coins and supply items Bryson lite, \$13A White, Toledo 5, Ohio.

ONE each 2c piece laberty make two Indian cen a 5 Consolian cents and 5 Unclining the Line of the Line

WE buy at race American coins Complete catalogue 25: Fairview Box 11.6-CC New York City 8

WE purchase Instablicad petit es Complete aurosta cutamque 25c Magincoina, Box 61 BO Whi es oue 21, New York

#### BTAMP COLLECTING

UNITED States commemorative collection our faithful J3 d Servict—190 Approvate Whi e 5.6-W Avenue L. Brooklyn 30 New York

225 STAMPS For only 10cl This manmoth value includes Airmons. Pictorian stamps from strange Court ties cataloguity up to 25c each Also Approvals Mintic Strang Company Camura 35 N Y

25c Approvate Magastamp St Catharines \$2 Options

WOW! 116 All Different Germany 10c Zeppetha, Semi Postala, Altinala High values, etc Giant Catalog, bargain lists in-luded with brautiful approva a James town Stamp, Dept. All 2PS, Jamestown M. Y

10) DIVERSIFIED British Colony Stamps only 10c, Approvais, Niagastamp, St. Cathartics 872 A. Ontario

AMAZING Offers 300 U.S. stamps—in clud is commemoratives atoms in high determinations to \$1.30 only for to Approval App. on at Limitated Bargain Late free Master Stamp Co., Dept. \$3. Camden New York

ALBUM only 10cf Hundreds of spaces! Stampmart Company, Hartford 1, Connecticut.

162 DIVERSIFIED Worldwide stamps 10c Approvals, Linetamp, St. Catherines 818. Ontario.

IS DIFFERENT US Stange Includes IS h Cettury Commembratives High Values. Plus 1843 Flag F amp of occupied Ha dis Al for only 25c Approvals the aded W 1842 Co. Box 188-Y, Yorklown Heights, N. Y.

23 DIFFERENT large American Commemoratives 10c. With approvals. Linstemp, St. Catharines 619-A, Ontario.

NUDES set (4)—Unusual Approvals He. Atlas. Eisenhower, Racins, Wisconsin.

PRFE! Grant Bargain Catalog - New Ed two listing housends of bergains in cluding U.S. and B.N.A. stamps, packets, mixtures, albums, accessories and sup-plies, sent with beautiful approvals Jamestown Stamps, Dept. E112PS, Jamestown. N. Y.

000 DIFFERENT Worldwide Stamps \$1.00 Valued over \$30.00. Universal, Hox 4. Kennsha 8. Wisconsin.

INTERESTING Worldwide Animal stemp concertion 10c With approvais. Niaga-stamp, 5t. Catharines \$73 b Onlarto

WORLDWIDE, 50 all different, abso-lute v (ree just to introduce our incom-pa able approvals. Kent Stamp Company. City) Box 1", Brooklyn, New York

FREE! Eight Sided stamp. Triangle Diamond, Midget, Mammoth, to approve buyers Plymouth, Dopt. 4-3, Bell. Call-

100 DIFFERENT Stamps, 15c with approvats. Smith. 506U Brooks, College Station. Texas.

EXCEPTIONAL 125 different rata of bug \$3.00 an oates trially in commentives the major vals, beeven Best proft P. Mismil 37. Provide

U. S. Stamps, Glant Bargain Catalog 15c, Raymax, 35-VK Maiden Lane New York City 28.

U.S., Canada, Catalogue send on y 20c New-Way Stump, Lawrence (3), Massaght some a

500 STAMPS 25c Joseph Caldar 6615 South Ashiand, Chicago 36. Ill.

FREE Fig. 1 marated United States

Cuttage Ir rodu tory Discourts Contra beromy a Inc., 45-8 Breenters, Boston MIRRO

30 U.S. Includes commemoratives, high values, 25c. Clatex, 206 W lth, MrKeespost Pm

125 DIPPERENT U B -\$1 00 Approvate Utechia 1,41A North Recier C's ago 3;

TERRIPIC Stamp Bargain Iceland-Valuesa Assortment-plus exotic trangle sets Also Jabulous British Coloman Arruma about P up arge stamp best an long offers free Send 10c to cover pestage Empire Stamp Corp. Dept PR Term to Canada

PREE United States Plate Block Price List. Atlantic Stamps, P O. Box 1753-PS,

Mouton 6 Museuchtantia

PREKIT Flower Triungle Set. 36 others different Approvals Wissum Stamps, Wal-

WEIRD Dismond Shape C. five Startus -- Labr v Flower Trianger Fl at American commemorative. Cirees untid Dancer ste toe with approvate Capital Stamp Co. Ferrisburg 10 Mich

Park New York 38 N Y

APPROVALS for Scott's International A'burn Part 1 E & G. 332 Ave. M B E Witter Haven Fla

LIQUIDATING CO. ALLERA 30 A SPC 1 als Jib lots, Moredan Stamps, Weilenter

POUR outres U S mixture Ten Cents with approved Ladwig 2871 Mars Omaha 12 Neb

Jaipur Kempian Pakistan PHEK Queensand Ta gany ka literater size apprivata ar ompany. Nade a 61 6 Cresente Plainte pina 20 Penns varia

OLD scarre U.S. seconds on applicafeed Chatonhill Station Newark & N. J.

PROM Hitter's Infernal Authentic Gerthan stamps and documents 9 9 945 assertance 35 do cash they och Box 830 Se na 4 Sweden

SUPERIOR worldwide mission mixture Amazing variety! Six ounces \$1 65. Pound \$3 65. Bay Nielsen, 4565A Harvard, Montrea 28 Canada

NORWAY Twenty Pive Different-Only be Approvals Norge, Ho-Ho-Kus, N J. PREE! 40 Different Portuguese: Colorful. Inexpensive Approva.s. Elkhart. Box 33. Elkhart. Indiana.

proving the course Shelton Bux 607 P New

MYSTERY Bag Stamp Collection, Only isc. Hill Company, Box 51 Defiance. Oh.o.

215 DIFFERENT L S Stam m \$2.00 Grassi 5.5 Calf Attaches Georgia Class Approvals Thousands Different ic and it rach Wahl's Stamp Exchange,

7808K Farragut Chicago 31 Il. PREE ,00 Dff rent Stamps With Approvals. Schoerer. Box 201, Pottaville. Prenne

ECONOMICAL 12-30 Approvals 33,000 varieties, Dress, Box 128-T West Englewood. New Jersey

DEALERS Wholesale Catalog Postage to Franksco, 5631 Queensbury, Baltimore ' ta. Maryland.

REQUEST Our Reasonably Priced Appervals LaRenbe bers 8 New York Lake by 38 So. Pine Ave., Al- 1

LOW priced approach our specialty Kelgwin, Box 533 Da t sia Beach Fur da

PREE | Pranklin Roosevell Gunt Tri-angle 25 others Different, Approvale Berchtold RPD #1, Troy, Ohio

PROPER Pang State of the compared beautiful A morales Hunties & Mil 4 Milones Seld. Pawtucket, Rhode Island

100 OLD U.S. Stamps between 1861 and 18to 6 to Proch blamps to Chestaut. Manifer & Ohio

BEAUTIES Pictorias from by an Monaco Hour R of Letard Trea New Calcidota San Marito Sanapur etc Or hy Approvata Champiam Isle La Meate Sa

PARTICULARY Want unusual stamps on approvat Try Bayou Stamps, Box 4.25. Pensacola, Florida.

50 INDIA live a fult appropria Detroit 34. Mich

000 DIFFERENT, \$1 00 with approvais Cir. let a #"21 East world, Physadelphys. 48. Personal Partie

BARGAIN Surprises! Beautiful Colonials -- Try als Africanan Commemora see -Bristoll, Canton Center, Connecticut

U.S. Mint #907-7978 Face Plus 2c Each 2029 21140 Plus 1c. Wilhelm, 16546 Men-Geta, Detroit 21, Mich.

PENNY approvals, blounted selection 1000 stamps plus free hingre. The handling Page Enterprises, Hox 1129, Lum-23c hanberton, N C

TRADE rouf duplicates tiward our approvals? (Foreign only ) Complete information, 10c Variety Stamps, Box 98-8 Newton Highlands 61 Managehusetts

14.000 DIFFERENT! Amuzing new plan Suilds your collection systematically country by country Only 50c weekly. Free details. L. G. Ware. Stepney 76. Conn.

66 BENELUX Stamps, Belgium-Bether a ich-a axembourg Did fesues Beta 10 With Amprica Truraine Box 2006 Santa Ana Cant

UNITED Nations Commemorative set 1905 bouth Cumbrand, Park Ridge.

PREE' 25 Egypt 5c handling Approvals Bellet Stamps, Hazel Park Michigan.

to DIFFERENT U.S. 130 Commemora-No approvals. Bridenberg Lives 25c Appleton. Wisc.

MACINIZICENT colorful super-set free to app mants for fine thexpensive approximate Trace 4465-34rd Ave N St Petersburg Florida

30 CHINA 10: Approvals Offic Coast. P.O. 18-5 Santa Ana. Cal force a

PENNY Approvals! Regardless Cata logue Electer, 4164—62nd Ct., San Diego 5. Cablorna.

CHRISTMAS issues. Pour complete sets free with fine approvals. Stamp Imports, Peterboro, Ontario

200 ALL Different Stamps Only 25c With Approvals. Wm. Rice, \$7 Washing-ton Ave., Kingston & S. Y.

KOREA Special, six different catalog-ing \$1 to only 10c Approvels accompany Quynn s. Scotland 7 Penna.

FEFF Colorful 216-different Stamp Collection Cataloguing \$5.00! With Adult bargain approvata Rush 10c post-age Philatelics, Dept. TE, New Paltz, New

50 FREE, Approvals, Adults, Patton's Stamps 660 Car Bunder C ty Nev

US at 22 25 Special -10c, with approxima Secreta. For 24, Bay Station, Brooklyn 35, New York.

FREE-valuable collections—each collection over \$5.00 rateing value pius many of et te mile a l'a l'act al en sue buy our sensat una foreign approvais Topyal. Box date No. on to Ch. !

APPROVAL Applicants-1962 Different-31 00. Klonstike, 632 Jefferson, Elgin, Illi-

litustrated. National Stamp News, Ander-30B. Bouth Carolina

10 BEAUTIFUL M nt British Colonies 10c with approvals. Bennett, Candor 3,

EXOTIC Collection free! Triangles, animais, sports, others Request suprovals Baird, Box 2113, Portland 1, Oreyon

DIFFERENT Commemoratives 1893 ap 16c. U S. Approvais, K & B. Box 10. prooklyn 23 N

PHEE United States Price List Of Sin-vice, Plate Blocks, PDC's. Introductory It seems Basic, 45 H Brombest Boston

56 DIFFERENT stamps frost Approximately Marford, Box 66 Queens Vivage 29, New York

SPUTNIK Czechoslovakia Stamps (3) 15c. Approvals. Seck Stamp Co-Frankin St. Auburn. N Y

U.S. Mint Flag set, complete, \$1 00. Free hat, Brooks, 2223-T Avenue X, Brooklyn 35. New York

PREE Mint Set! Approvals accompany. Mintro. 5:51 Princeton, Memphia 17, Tennessee

so NORWAY 10c; Economy Approvals Samman, Box 702. Berkeley, California.

SURPRISE Set, Pifty British Common-wealth, Free with terrific approvals Kawartha Stamps, Box \$13, Peterbora, Canada

CUBA 100 Diff \$1.00 400-\$30 to. Box 502) Los Angeles 55. Calif

1000 FINE Mixed US Stamps 35c Wright s. Box 1/22, Hagerstown, Mary-

ADL: TS like Stamper Then start your own Mat -Order Busiless Our Free Haidsize p octam shows you exactly what to dt maker it eas profitable for rod De-taile Free Combine Brist-RP Propp Batten Road Stever Boring Maryand

1010 DIFFERENT World Wide \$1.00 Stamp tr m over 40 mantres CE Stamp Co 80.2 Stampan Road Renoshs. With the star of

1500 STAMPS \$1 00 On and off paper Good variets. World wide Main pictorials. No approvals folder Satisfaction numbers enteed Whales, 4446 First Ave., Oakland 4, Calif

TERRIFIC Value Eight Complete Mint Bets for With Approvals Beauer

35 DIFFERENT used Canada \$1.00. Cleun undamaged, Thompson, Box \$4-P\$. Sailnay, California.

"00 MINFD US Various Dauge 25c Monjar, Fairmount, Cincinnati 14, Ohio

U.S. Calabor free Chiltana amost 1009 parts 5 one. 260 Washington. Boston 8,

CANADA Apprecial collections Enclose

POLYNESIA girl. Ryukyu hon Chiang birtada , Czecho mushrooms, Izrael musicans trhana Mkrarra .v loc Albums cata qu nanv otters free our manricala bu rra. Bell Stamp Service, PSS, Reil, Cacalini bia

CHRISTMAS Species 231 different large pictorials, mostly mint \$10.00. Catalogue of \$7.00 for size to gon at teed. Ruyalton Stamps. Bethel, Vermont

NATIONAL Parks Jets M fees Day U.S. U.N. Fee When Pulchashy Ap-provate Details Stamp Parks 51 17 Ox-ford Wisc

SURPRISE World Packet Pres With Approva With double 6. Norwich, Conn. 50 DIFFERENT, 10c. (With Approval). Butchison Services, 2400 Spiller Part Worth, Texas.

2000 DIFFERIOT was deade for approval Buyers Only, Jacobson, Crompond, New York

PREE United States price list, Carlos Bibert, Box 222, Mt. Clemens, Mtch gan

BARDAIN U.S., 100 different 25c, with S. approvals. Stamps, Kennebunk, Massa.

U.S. \$1.00 buys four fine unused nor-mans #C7 #C.0 Approvals as ompany Whiton Palms, Westport 12 County of

BAHAWALPUR Victory attains suc dime with approvais. Tacoust Stamps Ancrem. New York.

## ANTIQUES, RELICS A INDIAN GOODS

SELLING 160,000 ancient Arrowheads. Describedes, Tumahayes, etc. List free Lear's. Glenwood. Arksniss.

SCALPING Knife, Flint Thunderbird 14 00 Cutaing Free Arrowhead, Glenwood,

16 ARROWHEADS \$2.00 Catalog 10c Redick 1061 Overs, Columbus 6, Olito

PMCTO-Hunira ed Indian Relia Cala-log 10c. A.'s Indian Relics. Box 303. Bell-more. New York

ILLINOIS dellige hund eds Cicled-Prate, Civi.war, Indian War, Wrstern M. seets, Kertactive Aprilia beids it fee Pistole, Plasks, Blun jerburses, Physiocka Prontiers, Dueling Pepperboxes, Match-lock Confederate-Union Swords, Bayonets Buset M day a 000 Contents Sanctioned

- \$30 000 00 Cr tedera e bita it de

Crive In ban Certa Agains Minerale
Franch - \$0 000 B or equip I didn'the as
Arrowheats Spear, sints, Discordals, Gold
Nutreta Stagerous Cours, Mounted Sirds Dag e rots es Hoisters, Idilitary In-na se Bend Sie (refundable) for inner Listing Heidtke, Wenone, Il

BOOK-Relic Cataing 50c Fifteen Arrow-beads plus Siearnead \$3.00 Total Selics Topeka, Kursas

## MINERALS & PRECIOUS STONES

OWN A Genuine Stone Fossi) / Brack-topoder Over 1000 000 Years Old Olis El 00 Tievel, 157 48 Tenth Avenue Bees hurst New York N Y

OFT Free Catalog no serious riskhound. gem cutter seners maker habbile or craftaman can be without Public butdains exclusive stems are a cee from the most suppliers and authorative in the Red Free haw catalog just off the press-vours for the setting! Write Grieger s. Dept C 12, 1633 E Walnut Passions. Ca forms

PROSPECTORS Learn from expenenced geologists, how to locate and or a home atudy course designed for anyone interested in expecting in valuable our deposits Write New for free literature Pa & School of M See Pest As2. Box 2519 Pam Springs tanterns

ZARTH Science -- Rockhounds National Magazire Subscription \$2 00 Sample 15c Box 1357-PS. Chicago (80) 111

THE Story Of The Genu a set of 125 colur the thirt out male demonstrates how items ones are 2 and identified cut and provides Learn how by reurself Shod & Jolic same, con de two gemis ces descriptor a nature. Will Jema Ben 1515-H Chi ago 10

COLD Ore Large beautiful specimen from World's Greatest Gold Camp. \$1.00 "The Old Prespector." Dept. P8-11, Box 384. Crapple Creek. Colorado

SAPPHINE and lour more un of gema \$1.00. Yen possisted gems barrouse shaped \$1.00. Free gem slet Lapidary entalogue 25c O Briefia, 1116N Wiscon, He is model 28. Cant

GOLD, Biliser Cripper Ore With Cata-log 50c Geneco, Earner Ave. Shebuyann.

BEAUTIFULLY Cut Australian Pire Ope \$2.08. Rough \$2.00 Ounce Pree List Western Gens. 2015 Stanton, Castro Valley California

14 COLORFUL and basic U.S. mineral specimens attractively boxed with descriptive forder \$1.10 prepaid Included free dimeans, bone pecket preve Hork Haven Mineral Co. Dept. 101 Whitehead N. H.

GPMS & Minerala Magazine largest rock hobby monthly Pierd Lage how artures p. Lace ada 63.00 tear Sample 15c Box 6075 Met une California

#### HORBIES, COLLECTIONS

INVENTING can be an interesting and profitable hobbs. Write for complete par-tic are frate ute of American enters Dept. 20-E, 635-P St., R W Washington

COLLECT Poreign Medals Daggers, Helmets, from Cross with ribbon, \$1.56. Cetalog 25c. Hobbies, Bux 71-A. Rock-away 56 N Y

PASCINATING catalog, hobbykits 10c Craftkit, absolutely free, your choice, when joining Hobbygulid, 550B Pitth Ave.,

COLLECTORS Matchbook covers, 100 Different unused \$1.00. Catalog 25c Arbum \$1.00 Char to Edelman, 1311 F East \$4 Car cany 1 One.

Varble's, 1805 North Parkwood, Kartingen,

MILITARY Miniam of Par Adult Con-betors And Habriella Catalog Cal War Catalog 23 Anties of the World Catalog 23 Napries is Ameri Cana 35c Each, Bussler Miniatures Box 207-E. Wollaston 78, Mass

POCKET Bilaards (Pool) 21 Page Book let With Pictures And Diagrams That Wil. Be Helpful To The Beginner Or Average Player \$1 00. P. Senth, Bux 2262, Port Wager lod

#### PHOTO FINISHING. PHOTOLOPH'S LTC

A Triple Value Quantity Prive Striple Color or Black & White 13 cap Black & White: 50c 26 Offic Photos \$1.00 Halls day Photos, Dept 12 Box 006, Denver

A 3-m-1 Value—Price. Quality, Service | 20 Gift Photos—41 06. 12 exposure rulls | Black & White;—58c. Color of Black & | White Interstate Photos, Dept. 12, Box 15 Aurora, III.

TWELVE Expense re rous 48c Wallets 20 for \$1 00 Lateurn Studios Dept L. Walletta Box 11, Lincoln. News

ENLARCHEMENTS Fight \$27 a or Pive \$x10's from negatives, \$1.00. Whart. Box \$78. Little Rock, Ark.

HOUL Developed 428 or 424 prints 1 supposed 50s 12 for 5x7 prints 8 \$1 00 12 \$1 40. Hagner, 1310 West Commbin Philadelphia 22, Pennsysvania

YOUR Photo On Your Christmas cards stationery Real ministure photographs reproduced from your photo, 100 Photo stamps \$1.50 Chesley Distributors, 2338-F Princisty Avenue San Diego 6, Call-

BEAUTIPULLY colored 2210 any photo 8. bo Diek's 8 udla Lagier je 12 K

PHYS. Modek Film For Lafe. K cak Plus for ever roll you send to de-troop Jumbo are Buck and White 3 Exp 80: 13 Exp 8 65 Redarder 6 Exp 35 30 12 Exp 86 50 Send april 6 entales for more an age Sa infaction mutating ... 665 Bgs Sa infaction 1820-PS, Bridaeport 1, Conn

EKTACHROME Ansouchtome 35mm processed \$1.25. Wallet plots flom sides 25: K day for plots 75: Set d for flee mades at Arme Color Lab Box 6025-PC Michoragouta Minteracta.

LUXURIOUSLY Totted Saloon Portract from your shotograph or negative \$100 Byron & Studio. 407 McCarroll, Warring-

#### 12A COLOR PHOTO FINISHING

PROPESSIONAL Quality 55mm Rodaprocessing \$1.15 Request "Pres Kodacolor for Life" Membership Card, National Color Corporation, Box 13331. Atlanta 24

#### 33 MOTION PICTURES, SLIDES **801 ND EQUIPMENT**

PREE Blackhawk a big sale catalog brim 16thon movies 7'x7' coint a idea Biggest selection and where' Projectors. terreras supplies bu discounts Or free every three weeks 12-page newspaper are buryout 15 four Blackhawk Films.

MOVIE Camera Film 8 mm roll \$1.50 16mm 106° \$3.00. Prec processing Better Films. 742 New Lots, Brooklyn, N. Y.

TAPE recorders, H1-F1 computer-ta Sleep Learning Equipment, tapes, Unusual values Free Catalog, Dressner 60 of 174 Street Fushing 65 New Yirk

MOVIE Film! Free catelog! Esc-H 47th Holly Kansas City 12. Mo.

to BRINGS big new Chie Manua! for the Smm-lamin Movie Maker Save \$35 on fresh B&W and Color Movie Film all Hone Process he Equipment Superior 463 444 N West Ct ago 10

shill sound shorts Tremendous as-more at of features 8 630 up Used animal sound projectors, 278 50 up Ca a log Abbe Films 4.) West 64th Street, har Abbe Pinns 4., West

HI-FI, Recorders, Free Wholesais Cata-City 38.

FREE Bargain Bulletin of 5mm, 14mm silent said sound films (specify size) from Castle, Official, Looney Tunes, etc. New and used shorts and features World's largest selection at discount prices. Peerless Camera Stores, 425 Lexington Ave. New York, Dept. 185

PRFF Cutangues 1 000 & UMM Prims traternational Plims, Greenvals, New York Bedner, 5300 So. Talman, Chicago

BPECIAL Entertainment 4 mm 50 feet \$12.00 16 mm, b&w 100 feet \$20.00. Tex, Box 100, Terminal A, Toronio. Catada

16MM Sound Films. Bargain Bulletin. Dequetto. 97 R Snow, Fitchburg, Mass.

#### M CAMERAS, PHOTO SUPPLIES

PORDICKOUND First 1 r professional cross of 3, 80 Fotofissis Pisters, 150 Tem-ple 51 New Hanels Court Die bt

PLANIBULE comera 420 i yr gueran-tee 21 92 pertua d Whit aker, Mains & Em. Owensboro, Kentucky,

. H PAGE Ptutographic Bargain Cataing list up the asa ds if photogra ser bar guess brild has no thour over cred ed on his user Dept 4-C12 Central camera Company 236 80 Wabaak Ave. Chicago

CAMERAS Prim Projectors Discounts Catava Free Photo Distributors, B & 4203B Sun Liego 4, Caul

#### MUSICAL INSTRUMENTS. SONO WRITERS & RECORDS

SONGPORMS and lyrics wanted, Mail-to TinPen Alley, Inc., 1830 Broadway, New York 18, N. Y.

SONOWHITEIRS Recording Company Wants new songs, Royalty basis, National sales, promotion if selected, No charge lor messies Bend materia, M.s.c. Makers, Dept. O-54, \$344 Meirose, Holly-Bend materter wood. California.

SONGS Into \$555556-Share \$33 million. de are year fur New Songwriters Songits ind a omitted by largest 5 m information supramal I ee Send Nordeke Music Pub s e s 6000 Sunset Hom wood 28PS. Car stra

SONGWRITERS! Protect your ideas! Hold all poems, songs! Write for safe, cor-rect procedure! Song Service, Dept. PS, 233 W 58th, New York 18.

POSMS Wanted for musical setting and recording Send poems. Free examination Crown Music Company, 49-P West 32 Street New York 1

POFMS Wanted Immediate v for Mini-cal bet ig and Recording Free Examina-tion. Rush Poems. Songerafters, Ackien. Station Mashville. Tennesses.

SOMGWRITTERS with outbaher con-ta a war some ideas Sha e royalt et No fees Send poems Songwriters Asso-ciates, 1856 Broadway, New York 19-P

SOPULAR SCIENCE DECEMBER 1959

ACCORDIONS—1908 Models, Lewest discount prices, Save up to 50%. Free home trial. Trades accepted Big color catalog free, According Manufacturers, Dept. 128-P, 2003 Chicago, Chicago 22

CHORD Organs—Save 4 Italian Crafts-manship. Play without leasons! Terms. Proc Trial. Proc Catalogs Philharmonic Importers. Department 119-P. 2003 Chicago, Chicago Zi

POEMS Wanted for musical setting and recording by America's Largest Song Studio. Send poems. Free examination. Five Star Music Masters. 546 Beacon Building Boston

PRACTICAL Violin Making" with patterns \$1.50. Supplies. Chelses Fraser, 2023 Stark Saginaw 3, Michigan

SWISS Musical Movements, \$2.50. Electrical 05.75. Spielman, 131 West 42nd. New York 30.

SONOWRITERS—Arranging by Speciallate. Music set to poems, religious and popular Offset printing Free information. Music Profits Company Dept Ph 13, 112 South aberman Chicago & III

GUITAR Making books plant imported woods tonic List for Wildwood, \$10 East Dit Bury York P. N. T.

RESCRICTCH CHE AND AMPLICATION OF THE SALE Price catalog Carvin PhM Covins. Carlocola.

ACCORDION Repair Guide \$3 Now to Build Accordions \$5. Satisfaction guaranteed. Parts. Fucher Box 402. Bellingham. Washington

MUSIC Print of From Manuscript To Printed Coor, McH Music Printing Co 333 W 52nd St., New York 19, N Y

PHONOGRAPH Records cheap protest 4 Catalogue, Paramount, Son 2026-6 Pine Castle Plorida.

#### RADIO, TELEVISION, SUPPLIES & EQUIPMENT

Princel 100% Couranteed Brand New North Stands of pulled United Hadio. Box 1000 Newart New Jersey

DON'T Buy RI-Pi Components. Kits Tape recorders, until you get our low low quotes return mail. Catalog tree. Hi-P debty Centre 139P lat Ave. New York 26 N. Y.

KITS Shortwave Radio 27 50 Crists, Radio 75c Amance 2050 40th for Brooklyn 6, New York

PREE Plyer Monthly, Electronic Surplus, Euris, 7018 Bay States, Island 4. N Y

Mam Gent Mine Detectors, Parabolic Reflectors Telescopes Picture Cutaing life Meet no Maniet. 68 Mass

PREET Giant wholesale retains on electronies hill transport as of its hibbr optics photograph. In occurred jone of take noted to law Write Lakiron (218) Everett Ave. Choises 30 Mass

MAKE TV Antenna For Pennies With Homehold Materials, Rivala Expenses to tunna, Bend \$1.00. Zanz, 1653 Harding, Seaside, Calif

Transit, if experimen = 25 Labora ories 1131-T Valota, Redwood City, Calltornia.

TRANSISTOR Radio, Pocket Size, Portable \$7.55 Postpaid, Free Literature Alexel Sales, Main, P.O. Box 321, Youkers,

CRYSTAL Radio Kit \$1.00 Preassembled \$1.25 Phone \$1.75: Catalogue Cicarco Crystal Company, 2006 No. 4th. Milwaukee 12. Wisconsin

ELECTRIC Challers amp hers while said Free rataing Carries PSH Corms Caufort in

FREE Accessory Elt With Acme Portuble Transactor Ran by Comman and CHCO 829 95 CHCO 642 95 Murrs Inc. 8:38 Heather, Fontana. Cali-

#### 22 RUSINESS OFFORTI NITIES

IMPORT-Export opportunity, profitable world-wide, mail-order business from home, without capital, or travel abroad Established world trader shape historical parter to judy examination Expenses a unnecessary. Free details, Mellinger X00C Los Angeles 20

OPERATE profitable mail order business, Write Walter Service, 6.50-3 East 212th, Cleveland 5, Ohio

il 000 NEW Prospects Daily. Bath rev ord books, shoes, albums Sell marlosner Use our literature. Write, No-Co-Re, Capitola, California

NEW Home-Import Mail Order Profitunity! Your mailbox stuffed with money! No Selling. No experience No investment We supply everytime. Pres Details. Mail. Order Distributors (Import Division), 15201 South Broadway Los Angeles ASCC

YOUR Own Import Man Order Business' Deal with over 400 manufacturers experters of the world Come etc Import price dures thirrhadional diop ship methods Capital Universary Free details. Associated, Box 2068-PS. Sloux City 4, Iowa.

YOU'll envelope addressed accurately teas mably Past service for the have apable at reservab out its Continue System. Non-Roll Cleve and a Object

\$79 WEEELY—Home, space time. Simplifted mail bookkeeping. Immediate income—raty Auditas 191519, Los Anreses 14

PREE Catalog. Contains hundreds of businesses, farms and income properties throughout U.S. Canada Specify type and location desired. Deal direct a in owners If I Buyers Digest, 1604 Hill-buss Dept. PS I Los Augelos 22 Calif.

QUICE profits with no capital Take deders for magazines sour to glibors the west Make cash in the spot we show him with Free his there is not be a Microsoft Magazine Agency Dept 341 Misset Morris Lie

FIX Typewriters Pres Repair Course Herris me and Remit 25s to best expisations For Course and Agency Appointment After Tarentum Pa

UROW Orchids at home. Profitable functionaling fluoresistal noise grower explains special light, temperature and humidity for tit, so, orthus need Free Ful de tails. Orchids, 100 S. Vermont, Lee Azgeles 4

MAKE Let a Money—Big Cash Cominis alons plus premiums for you and your custome a Sell Advertising Book Matches sensat small new Tenurams (ame a Gue H ib lies dozens others Al stree-Gual data) rates big repeat business. Free Master Kit makes selling easy—no experience necessary Superior Match. Dept PX-1236 7536 Ottenwood, Chicago 18 Illinois

st50 00 WERK profit possible Earn at home spare time with factinating Printing method. S5 starts you—send no money now Free Confidential Farts and Valuable Samples, Screen-Print DR Los Anacies 6.

\$105 00 WEEKLY spare room. Raise red worms solliess way (2) riess Charite Morgan, Box [16C, Bushnell, Fjorida

PRIE Name Brands Cutasof! Your own high print business he I Maine Brands in the art time No name is no investiment More than 2000 Name Brand items lowest wholesale prices. Watches, jewelry cutaries he in the world he is indeed as prices housewares to the experience power in its imagine is a salar view a process to the indicate and there. S Ploots of Rame Brands Million of the head in the salar process of Rame Brands Million dollar inventory. Orders shipped complete at a 24 feet at the New York 11 N Y

BRONZE Baby Shore Instructions
Equipment and Mountings for genuine
Electropiating Process Largest Supplier of all Piating Equipment, Supplies Pree
Catalog Hot was Mounte but; a Dept

874 Hast Pirst Lon Angelon 12

IF You Like Motorcycles And Money then send for Harley-Davidson Designship Book on how to become a franch sed dealer of mator les and a new line of motor security. He es a charte to own our own by messa with a very modest in restment. The own bemarket a british se a charte to rash in on t. Wite fo. fee illustrated Dealership Book Today Hardey-Davidson Motor Company, Dept. P.S., Milwaukee I. Wasconsin.

\$1.00 HOUR chome, sparetime, assessbling pump lamps, East Free Details, Ought Cardwell Arkansan

PLATE Beby shoot, jewelry, s.fta. Bronze and colored pearl. We finance home businesses Bookjet free. Williamson, 11828 South Vermont. Los Angeles 44.

54 NEW Home-Bustness Ideas" Booklet, sample Free, Spray exotic Velvet-Suede on anything, Flokeraft-DR, Los Angeles 61

I GOT rich in the Dry Cleaning Business—w. h no investment so can you have ortain We e-large and School of Dry Creating Dept PSC 1700 Touthy Avenue Chicago 26 Himots

PLAQUES Figurines Molds Free Details. Russe, 1194 Brooklyn Ave., Brooklyn J. N. Y.

PLASTERCHAFT molds, liquid subberplasters, flocks, randle supplies. Cutalog and manual free, Jayhawk Plasters. Blue Rapids Mar ass

MINK Has of information free Complete. Lake Superior Mink Parm, Superior SE. Wisconsin

GROW Hving Ministers Forest conty thehes high or or hald that bears takly to a little Leach pictures Drug Long sourcess Fast had a hobby Fruhtable Homes-bushess Open to 1 Free Seeds and Plan Stars sour ages Minister Names ocean Drut DR Cas area. Castoritis

FREE Picture Folder 'How to Make at two Yea ! Sparet me Bu hand, Rading Earth worms Onkhaven-42. Cedar H. 1 Trans

SELL By Mail. High Income! Everything Furnished Irvin's, Box 1852, Ohia. City 1, Oklahoma.

BAKE New Greateless Complicate In Kitchen, Sell stores From rec on Summers 1965 South 15th Mattheopolis I Mantheopole

WILL You test new Items in your home? Surprisingly big pay Latest conveniences for home car Bend no money Just your name Kinger 11 Abron, Ohio.

BIG Money—Operate own Fix-it Shop. Service household appliances. Instant, we was a same shades etc. Free Book Christy Trades School. A-8001, 2216 Law-rence. Chicago 25

32-PAGE mailneder 'Slomework Bullein.' icc. Tasker Box 3131 Alexandria, birgies a

PREE Literature - Make Big Money Raising Plus worms and Crickets, Carter Farm Plans Services

WANTED In etagent people to study me I terature and east reak prises Quarter brinds pasticulars Ovinteen Du Quois. Id most

QUICE Money? 'Repairing Cat Batterlea' At home! Easy, too! Pres Details! Batteryman Penrose. Colorado

Beginners," \$1.06. Tasker Box 3131 Alexandria, Virginia

NELL Wentherstripping Rusept on all profit Alt-Metal, simple to insta. Write E-2-On (P6) 1000 Harvard Terr Evaluation, Ill

MARKETS Everywhers. Make Artistic concrete hirdbaths pottery Best coloring Home workshop, Hundred varieties, Hollywood Cementersft. B577-N Wonderland, Hollywood 48 California

OPPORTUNITY to earn \$15 000 500 000 are in Francisco professed to an edoc size to but it was home. No mer hand so to but its feetuniant One of must excusive and notes that Canada bed for fee expansive to backet Harre's and Company But it is to be.

WASTED Men Women Raise but for us at home but spare one Issues titake up space. We tarish everyth in Marre wood Dept 55 Montages h. Marre

DAME Warden to returned banter From 18 Fa h and Wildlife Services announce job openings. All atmes Energy outdoor work and ps. real security Complete into amaion Free Write North American Science of Conservation Dept. CC-18C 1938 S. Le Brea, Los Angelia 18, Cahi

HOT money making plans, Ideas Send dime, stamps. Ed Sweigert, 36301 Pern, W. Johnson

\$120 IN Sales From \$10 Material- New-Different, Everything Furnished, Writel Russell Morris, 1501 Root N.E., Canton 5. Ohio

VENDING Machines—No Selling, Operate A Route of Coin Machines And Earn Amazing Profits, 22-Page Catalog Free Parkway Machine Corporation, Dept. 18, 715 Ensor Street, Bastimore 2, Maryland

MATICKIPH Laws and Regulations and Ma. order Ruses for Beginnes, \$2.00. Explains maniorder licenses, mailorder taxes, etc. Tasker, Box 3111, Alexandria Virginia.

SWIMMING Pool Pranchise. Small investment, partial financing Write for phinture Box PBM 1262, 125 W 41 St., NYC UHA.

ME Cast junk hetter es in o pen Latest achievements. Has est Laboratories. Basou-Latiste Alabama

IMPORT-Export Business Made East In hydrous setup services and just and are tions Harmen, 152 R West 43 New York City 36

Plano Tueing learned quart of home Tremes dought of Manual has aways up necessary tot making free Empty & box of Piano Tuning, Champaign, Himola (Pounded 1935.)

BUY Direct From Factories - Appliances Can reas. Watches? Froe details! Cam Company 68,00% Set Are, Brooken 4 New York

IMPORT Mail-Order Plantes bustfieses offered in new stream/hed three in sie miles-making opportunities. Free details, Trialpha, 7850 Mammoth, Dept R 2, Van Navs. Capi

MAILORDER To Churches, Motels, Restaurants, Institutions, Complete, individual set-up-not just instructions, Hermes Advertising, 152-G West 42, New York City 36.

83 000. MEN Women Work Home Sparetime! Free Confidential Plan." Scott. Box 388. Great Neck. New York

BRILI Blocks by many 400° profit Repail Box 198-14 Circuia d 2° Obje

PHEE - Exciting Details - New Complete Profitable Hyme Chernied Mail Or der Business Serup Enstern, How 142 Boston 24 Massachusetts

MATURAL Moiding Rubber, Extra Thick, Free Sample Wooley, 1916-B Donald, Peorla, Illinois

MFTALLY Rate Shoes, Repair Dolla Rebuilt Batteries Catalog 75 Measure Universal Box 10:4-B, Ptoria, 110-

EARN money at home by mail. New book tells how Literature Iree. Cur's, 64 Chest-nut. Saugus. Massachusetts

.000 2 PROFIT new easy home may order setup dealing in name lists. Write Factory Agents Bureau, 115-B Liberty, New York & N. Y.

EARN Good Money energening chain taws, scissors, cutters, knives, Free Manual Treyco, North Tonawanda 1, New York

\$10 WEEKLY addressing envelopes, clipping newspapers, Detailed instructions \$1 refundable. Ches Boante Box 200, Great Neck, New York.

ATTENTION II You are The Owner Of A Practical Idea That Can Be Manufactured Then Let Us Hear From You Immediately Adam Pisher & Associates, Established 1911 2221 Delmar Bod St. Louis 16 Mo.

CASH from Sawdust, Tin-Cans. Newspapers Over 200 methods in true, que st of Charles Company, 43-DPM Nor-

MAILORDER America's mill ut que no test pub for beginners. A mitring's 154 Darrington St. S.W. Wast, tutten 24 D.

COMT 5, 00 Retails \$60.00 Manufarture distribute newled hope product Easy Samue dela s 50r refundation R Stapleton Products Lumber City Georgia

FREE Imports From Overseas Particu- | lars Free Bassens Imports, 528 Finier- | ton, Chicago 14, Ill.

WHAT is the Mad Order Bushess? Oct the one true answer John Bishop. Box 153A. Ojal. California

MARK \$5,000 \$5 and Year at home in respectable field. Puture growth unlimited. No experience necessary, no public con act nothing to grow or make here expert to dame helps and arbieve financial at, each Rush \$1.00 today for compare data at Sainta tion or refuld Culandia his epities \$266 PS Piney Branch Rush \$1.00 Breek Spring Mat and

OPERATE Profitable Low Cost" Mallorder Dayness' Write Liberty 250 Faith Avelue, New York 10, N. Y.

MANUPACTURER Pishing Lures Plantic none better 20 Models Pennies, Freq circular Quaker, 1514-34 M Lawrence Pilits 46, Pa

MOTEL-Resort Management—Qualify for bur-f eds famins ing leasurely well paid executive openings Learn at home. Free booklet Motel Managers Training School P6129 612 8 Serrano. Los Ancess 5

100 PHISFIT secting terondst cled spark plugs Free dample Lee 1464 K Rolles a Mouston B, Texas

PLAN and personal help Retired manorder opera or will show you have to start profitable home business M Cole 217 a West 49th, Bradenton, Plorida

LIQUID Molding Rubber, Free Sample 'She is ait Supplies Chancel a 180" t. East R aid Jackschville II Fia

MUSHROOMS Quicker Easter, Cheaper Magic" proplanted trays. Newset Facts Prec Spania 11 60 Lunero 64, South 16th St. Newark 1 M. J.

YOUR Own Successful Business can being \$1,000 monthly by mail at home Free details. Delang Research Box \$2-C Burbrigton, Ir an

OPERATE Mailorder folio business Free details Ballard, 1834 Edgeland, Louisville 4, K)

PPER laterature Huge Profits New Prosen Busiless At Home Susy And Pum Dot ( Walt 'Ir seal Driftwood Mira., 15 Benson Road Bethel, Conn

MONEY From Your Mailbox Daily Free Details We had a Service 10.6 I Chan-

EVFRYHODY Lates Cand Make Professional Home (Our Min Year) Raymonic Candies, Dist, East Grange, New James

FRANCHISES make profital Operate your own independent franchised business as distributed dealer or agency owner Mational Branchise Reports is the recognised source for info mation reserving the branching franchise for Wille India for a tree sing free driving of this helpful service. National Franchise Reports, T-528, 312 North Michigan, Chicago 1

CATOLLO Primorn and Porato Chip Equipment Eakins, Box 933-89 Springs field this

PAFE V. 101 "Reveals Tremendously Profitable Hame Ma lorder Business Opportunity". National, 221, Agnew, Call-tornia

MANUPACTURE Import toys, vinyl de la piush animala, dollhouses, Big profits Benko, But 184-B, New York City 21

\$14 % TWO Hours Manufacturing Conthere Products No Setting Car asta Cast sters 1403 Fremant Haptd City Bouth Dahota

EARN from Weekly part time from some arm that and in one car somit a case a F or F p to bumps from No selling or majories Pan Pa fit Time B a 191 Laguna Beach Castleria

875 00 WEFKLY possible ma. ng catalogs Roe 23.7M Marahali, Chicago 23. 1 1

MAKE \$46 From Square First Fixwood Jissaw necessary. Free Details Woodarts, Bridgewater, Mass.

AMAZINO Profits making concrete drain tile! Detain free, Cetten Products, Cornella Georgia

MARE Money Malling Circulars, Details 10c Jones, Box 2215, Washington 13, D.C. COLORGIAZED Concrete pottery made without molds Patented method. Cemeters product that have been a fire Baselier than been any Mone what is gut been a Hack let details free Mer of Na (a) Potteries. Grand Rapids. "Minnesota."

YOU too can make money out of Popular Science classified advertising. In these pages you see hundreds of classified advertising pages you see hundreds of classified advertising pages and these advertises and set of the end of these advertises are the end of the en

#### MONEY WARING OPPORTUNITIES

DFTECTIVES-Work home-Travel Experience un constant Detective Particutain free Write Wagnuer P-125 West 16th. New York 24

SELL Titania Gema for more brilliant that dam and Catalog to Disassique 2420 % 70h Calcated 5 Caption a

MAKE Money Writing Short Paragraphs Information Free Barrett Dept C 38-D 7466 No Clark, Chicago 26

MER — Western Brack Money-Making Plants Laminating Bombess at home in again their Make at hat room 12 brings be k \$2.50 No cartinating of seting but man orders bring in \$20 g day. Write for fair party users free Hugh name on post card to Warrier Hoom CL-3 L, \$512 Jarvis Ch. aco 36 13

START Big Fav business at home in space time. No experience needed to operate attacks to purchase for bronzing baby ships Make 63-64 profit on every pair Full particulars free Bend postcard to Manon, 1512 Janvia, Room CM-3-L. Chicago 26, Hanois.

MAKE Big Money Top commissions soliciting de siquent accounts. No prestment required Instructions and supplies ires. General Phonos, Deak 7, Pickwick B dg. Kansas City 8, Mo

EASY to start rubber stamp but reas at home in a sure i me. Make up to 69 90 an hour without experience. Fa to free Write to Nobel 4, 1512 Jarvis, Room CH-2-L. Change 24.

AMBITIOUS Single Men-41,000 00 A Month Average For Life Seem Fantasin 1 of Stow You How Write Shirl E Bruther Bux \$75, Waranae, Only. Haveal.

MAKE \$5 000 yearly sparetime rations make his his his his his per Pres book let revenue or ned plans. Write: Purs 548 Mr. Pleasant Road Toronto 2 Carada

SELL b ma Free deta s' Hunhuss.

PENNIFS Before 1916 Bought List Of Press 20c Lustrand Coade 30 B. h." plus Old Bilver Dollar-63 00 "G.fts-Unusual" 316-PS Hobart, Orand Rapids 7, M.ch

VENDING Machines—No fielding Operate A Route of Coin Machines And Earn Amazing Prints 32 Page Catalog Free Parkage Mac in Colporal in Dept 18, 715 Electr Street, Button ve 2, Mai land

White Russes Tupper Sandwich, Mass CRARETTES-Make 20 plans or filtertips for St. Facts from Moberly, Box 911. Owensboro, Kentucky

PRFR 1. crature — Make Big Money Reising Pishworms and Crickets. Carter Parm-11, Plains, On

CASH Romework? Permanent Employment! Free Outfils, Harach, 1361-11 Hos New York 50

PROFITABLE Homework! Quaranteed Enrices No Se ling Enriching Supplied Enriching Supplied Enrich Self-Beauty Mail Freder N. H.

BIG Profits selling ties, \$2.06 value. \$4.50 down Free La alog Empire Cravala, 456-PS Broadway New York C.y. 1

is PROFITABLE Businesses You Can Start Yas set Pree Bookset Arkansas Valley Printing Company, 218 East 6th, Little Rock, Arkansas.

MONEY-"12 Ways To Make At Home By Mail Plan " Details stamp, Walter, Box Watsonvale, Calif

\$20 000 POSSIBLE \$5.00 investment Pres details, 131 W Rachmond, Richmond,

MONEY Making and Saving Catalogue Write, Adams Exchange, 310 5th Avenue. New York 10. New York.

TREE-mastroom planeers Spain in atructions. \$1.06. Ohga, Pti-173, Sugaten-Bullette Japan.

SKILLED Photographers Money Opportunity. Write Brak Laboratories, 50 Court Street, Brooklyn 1, N Y

MAKE Money Clipping Newspapers For Information, write, Newscraft Po-163-E Main. Columbus 5, Ohio

AMAZING successes through franchises Decisine par us ve franchise houser your terrory Information rushed National Farman Reports BP-526, 333 North March 19 care 1

1200 00 MONTHLY Blate I me With Tableton Bandson of Jigsew W 10 Houselday House, 1212 4th Plain, Vancouver Washington

SUCCEMB! Earn \$100,000 00, retire he-fore there! Details free box 7/ Indian Vailey Va

BELL Information by Mail 16-to-1 profit Pario Va lathe Suggestions Free Rawson Wood 2754 OE Pallecton, Chicago 47

OPERATE home Mad-order Business Vosacuk Frinting, 4444PS Uts. San Diago Pl. Calif.

MAKE Easy Money Addressing Mailing Pleasant Work, Write-Merrila Hotand, Box 1621t, Hatfield, Pa.

Took PROPIT! Learn How A 81 Invest-ment Rets as 48 At Once Plus Continued Steady In one No Seang No Essen erre Noressa > Hush 6; To Emersed Com-puts P O Box 145 Lincoln a Nebraska For Complete Plan And Pres 86 Page Wirelessie Catalog

PROFITS through Popular Science classified advertising! Thousands have made poster by seaing needed prious a stall se vices by man order -you can too led your ages message to 7 m but be terrial customers in the classified Opport diction Section of Popular Science Midding Let be end you out free parts of the How to Make Missey out of Class priet How to Many many a posts rare street Advertising Sensy a posts rare topsy to O K Krdy C assumed Accessed to Manager Dept 179 P passar Sensy to Morthy 235 Laxington Ave., New York 17, N Y

LAROEST Whosesale Supply Source in U.S. Get free catalogs. Purniture, clothing. appliances, autos and accessories, farm, equipment tooks housewares who sup per Free details. Associated Windowsiers Said 2068 C Britis City & John

OLD Wall Temphaten working order. Oak Cabrieta, hand reall for roung \$1 each. FOR Temphone to Turtle Lake

SAVE 33 Purchase Everyth ng Whele-Magazines Proc. Parts ture Write Whale angers 277 Jacksoft vice I assure

NEW Matters in Wholesale Catalog -automobile catalog-and others Housewares apphances, reirigerators, freezers, washterstweet, radius farm ture ere drogen, enothers begans bine uses projectors comeras, projectors typewriters, sewing machines, power tools, loys, sporting goods, watches, jewelry-name brands—have discourse Postcard Selbyco, Decatur 173, Illinois.

BUY Wholesale, 100,000 Nationally Advertised Products, Appliances, Cameras Sporting Goods Housewares, Water on Typewriters, Tools Cicketter etc. De-rou to to 40 Buy-Rits, Box 258 Haw-Buy-Rits, Box 258 Hawthorne 1 New Jersey

CATALOGS . Hundreds of Items, Big Parings \$1.00 Day d Durretta, 1946 East Tremont ave Bronx 42 N Y

SAVINGS Galore-Discount Prices on Ters Tools, Apparatus Housewater Hundreds of other from La est Catalant I Free, Price-Quality House, Dept. PS, 3112 Jarome Ave. N T C. 6L

TRANSISTOR Radios. Debaxe 4's. 6's \$12.75 up. Kalenak, 1108 Heeney, Johnstown, Penna.

CATALOUS Directory of over 05 free wholesele Catalog sources, \$1 66. Ozco, Catalog 2 Cr as

ELECTRIC Guitars, amplifiers, whole-sale Free Catalog, Carvan, PSW, Covina.

SAVE 65% Appliances, Clothing etc! ( United Wholesalers, 1265 Broadway, New York 1, N. Y

BIG Sale Catalog Free on Name Brand Items. Madison Mail Order Service. P O Box 65-A. Frankfort, Ind.

#### FORMLIAS, PLANS, PT.

FORMULAS—All kinds, Latest products Literature free Kemico, Park Ridge 15, Ill

LATE Modern Manufacturing Formulas List Pros. Chemical Service, Martviut, New York

ANY formula \$31 Formula Service 111 Mapes Avenue, Newark 12 New Jersey

19.000 TRADE Secrets-Formulas-Processes-Recipes And Valuable Money Makthe ideas. Portuge in Formular Great est. He was do at Book Or the Market from Bark Of Money Making Values Money Bark Guaranter \$3 to Postpoid (The Reed at \$20 Cherriles Ave. Fant 4 Marth

SPECIAL Formulas for latest money-making discoveries. New! Good! Profit-able! Valuable Literature Free! Miller Chemist. 1817-H Tamps. Florida

LARGE Formula Catalog 18c Big Surprise Western Chemical Salem, Ore, 42

#### PLANTIUN

LEARN Plastics Pabrication For spare oms income. Low cost home training a sevantable. Write for free bookset Interstate Training Service, Dept. D-3. Portland 12 Oregon.

NEW Liquid casting plastic over got ore Linterd sea & ners betterd to phe the case Send 2st for two hangle-ke How to Cast Liquid Plantics and How to Make Extra Money at Home (asternal light) ate Dept P 02 Worth with 1 I note

ELECTRIC Laminating Kit Pun proc) \$14.36. Therm Appliance Charles, III

LAMINATING Supplies Price Last Free Solomson, 4 Bearham, Everett 49 Mass.

PI EXIGEAS Any 15 kness - Clear Coa . Cal to face Cient Reds 2 to-Ranguer Pendius had a

NEW Do-It-Yourself casting and Mold-ing Phatical No Experience of Machiner; Necessary, Send 25c for Big 64 page cata hog Casta raft Corp Dett 1 .2 Box 5.5 Palo Asto, Castlorbia

CELLULOID accap. Shrets, state of the ness, polors, Plantics, Box 2006. News & 3 New Jersey.

PLEXICALAS Square foot cost 1 0" 81 29 's \$ 32 J 16" 6 84 's \$ 21 's 61 2J 's \$4 34 Cost a add 0 bend 12 for pos age Amstoriat Plan tick, 21 Susset Amster Nemark S J

MANUFACTURE Jewelly, N set re Flowers, Lenses, Lures, To a Others Instructive Catalog 25c. Oel, Box 26. Union, N. J.

#### SCIENCE & CHEMISTRY

AMAZING New Book Of Science Even i merts to roules and Campage of Jahr fairly Bupp, m. Only abl. National Sci-enville Co. Dept. PS 12 (3 & Park Ave-ture Lembard Third s.

MICROSCOPY wides at atomical Free list Bay 400 Roomevelt Way San Francisco at Ca. forms a

CHEMISTRY Microscop of Insect Bulterfires Rocks Mane als deta. Complete. Laterature-Amateur Chemist and M. cro-Mologist, 202 East Eleventh. Kansas City.

36 RADIOACTIVE motope experiments for \$, 00 for Righ School Students, Atomic Researchish, 10717 Vennce, Los Angeles M Cail

HAUSTRATED Catalog: Chemistry, mine alogy bedong the Tracey Laboratories, Evansion, limited.

CATALOG With 3000 Illustrations \$2.08. Laboratory Materials, 7318 Vincennes, Chicago.

CHIMICALS and apparatus for indus-irla, and vicel and t. rate laborator, a Catalog 25c Dept. M-26, Biological Supply Co., 1176 Mt. Hope Ave., Rochester 20, M.Y.

MICROSCOPY'S educational research. tarreviou I strumen a electronics of de-cal ever to Lg. Jajannese Importers' p. cen. cataliers 35c. Magainfration Insten-ment 3 K. 4. h. New 3 c. k. 17

ROCKET chemicals, chemistry set ref in Apparatus a seaware Catalog 25c Bo Cirt. co Prod to 26-P Sumpret Be mort 's Massact usetts

Tape Will Doniphan, Widwood (18

CHEMISTRY Catalog 25c, Experiment Book, 25c. Used list. Laboratory Seles, Box 16) B Brighton Mass

UNUSUAL Chemistry books courses. Ents! Rare chemicals, chemp Cutaiog 25c National, Box 131-A Pass Alto Lai.

EXPERIMENTERS. Bargama Oalore" Ca and Joe (Refundable) Hagenow Lab-

HOCKET Chem cals, Supplies. New Catal of and plans sent with sample hit of fubra fuse form an amb and surfur 8. 00 Central Rocket Company \$50. Wau-para. Wis

CATALOG 25c Science Fou iment and Engering coa Proctical Sciencine Esta-cada Oregon

AMATEURS! Chemistry Laboratory Materials. Cutalon the Mast Scientific Manshowne W wo men

SCIENTIFIC Odnities " @ Page Book-let, 19c, Franks, 3121 South Racite, Chi-

NEW catalog low priced chemicals apparatus biologicais, inferoscopes Catalog No. Winn Chemicale, 124P Street, New York 11. West 23rd

#### HELP WANTED REPORTS

COPTRICHTED Reports, Best paying companies-travel, adventure, promotions. Construction, aviation, shipping olifields laborers, cierical, trades, supervisory, fac fery, unusual opportunities. Skilled-un-th led Forest of sende Orth \$7.00 (\$...5 Artmail: COD : A repleat Same-te on guarant feed included free Special trimete of Alanka - Vereness death to the Roses h florit et Meramer florid et hi Louis 5PS Ministra

JOBS on Steamthips Yachta trave no foreign countries. Davenport a, 1554-J, OPO New York 1, New York

PREE Information - USA Overseas Jobs Righ Pa. Transportation-Face et. 1964 P 225 West 34th Street, New York CIY 1

PORKICH Jobs Lat h America, Asalka peter i matter hot at al flore haing for Matter and Cot als Construction Airrest in Registers imported Maning How When Whe e to a, or 17th hor cossiul year \$2.00. Grobal Reports Box 8274 P. Les Angeles & Cautotte 6.

WANT A Good Overseas Or Bisieside Job With Haber Pay ?? Art New Ar Occupations Needed Transportation Pard Per Information Population Part Read quarters, 78 Wall Street Dept Des. New Y all h

JOBS. Ships. \$100 Weekly Beginners Travel, Adventure, Details Fron Seamana Service, Box 17-P Brooklyn 8, N Y

NEW Factories! Hiring thousands! Lo-cations, 50c Griffith, 413 Latham, Wynne-wood. Pennsylvania

BOOMING Latin Americal Prosperous Brazil, Venezueia—Only hours from the States. New data regarding johs, opportunities, conditions. American companies employing etc. All skills required Sainnes to \$1.650.00 monthly. U.S. Tax rxetrut Bon see thing ask wanter travet expenses exciting varations, and more! First-hand information direct—8, 00 : \$2.35 A(rmail) checks or mobel orders La of American Opportunities, Apar'ado 10212, Sabana Grande, Caracas, Venezuela

JAPAN Par East' Many hi-paying John are able new A Trues Complete de la sed ress' is \$2.00 Waits Box 003 C P.O., Tokyo

CERTIFIED Foreign John-Men, Women Amer as f en at searing publier of overscall employment 1 of C a rast Resear her Bax av . has note to Md

#### AGENTS WANTED

ACENTS-300' profit selling genuine gold wildow setters athres and off es Free samples. Me a ic 8 gn Letter Co 1217-E West Newport Change

OOLD or Silver letters, numbers, Windows Doors, Tracks " to 6" 500 Prints - Pres Samples Atlas U Box 541 Oak Laan In

EVERY Man A Prospect Request Refuncial e Sales Est offer show is time of be t buskies of clause in me is a cult is he agest that is made in being e a hance and out on a asso can beinger for trucking bus at process A emen that e 3 000 en hieras. Hank Past Busk 14.5 PS. Provide of Rhode Ja and

START Your One Bosness On Creek & U.S. and Canada Your care bees that Dealers and \$5 000 to \$31 500 in 1956. We supply stocks, equipment on gredit 200 home necessities. Hales experient a undecreases. Present profitable bus was backed to would wide industry. We to I amough a Dept. 1.1 PSC. Presport. Later a

MARK Mopes of the service to Dearf Trees—bear Gladt-Size Apples, Fraches Pears, Ornamental, And Stark-Burbank Standard Trees Roses, Shrubs, Vines, etc. Outfit Proc. Stark, Dept. 20150, Louisiana Masouri.

MEXICAN art goods Free Samue Send ler Famus making Stress Apartado 90.6 Mexica C

b) 800 00 a mon h for making dramatic Jives and determine at an I amon at an weight Presid to East a set New chamical used by Airforce abusts out firm (rith a section Free R., Mes. + 114 E. 32 and Dept. P. 844; New York 6

YOUR Own business—Built \$1.50 Over coats die, Markinaws 35c. Shors 12 . Ladies' Coats 30c Dresses 15c. Eng weak profits. Catalog Free Nations Mar Over 2.11.J Roosevelt Road. Ch.cag. 8 J

startly removes blurry Mist, Front, Sleet Show Stops windshield togging Samples sent on trial, Kristee 65, Akron, Obio.

Nhill res 2 Year I sht Bubs to the new res far est Ha n 40 man ar ar free heart he free heart he tric Products. 266 Flith Avanue, Dept But New York

MEN Women! 60°, p. 22° of a green of the state of the same of the

SEEKING New Products? Get my outfit 47 moneymaking specialities Latest conreniences for bome, car Send no money Just your name Kristes 68, Akron Onlo-

AUTOMATIC Needle Threader Sells for \$100 You make theore this amount ideal for fund raising. Details free, Moore's Whosesale Dept 6 Iobia, Mo

MAKE money selling ties. Pres catalog Write to Philip's Neckwear, 22 West 22nd. New York.

BUSINESS of your own. Earning potential as high as \$40,000 and a y layed on \$.2,000 base no merchandise to buy Send for free explains as back at Harrell & Company B. 6 DD Louistine I... MEN' Women' Earth extra monty. Free , Details. B. W. Wail, 1971 Linden, Zanes- ( vale. Ohio

EAST handwork makes fast-ceiling uncful articles. Sample free Summade Company it is the 64 Massachuseus

on PROFIT is any record to ned spark place Free Sample. Lee, 1604-C Roberts, Houston 3, Texas.

PEATHER Christman And Greeting Polders Dozen Assorted \$1.35 Mexicanos, 1104, Calendo, Calif

STOP Losing Han New Postade with 30 lar villa and a hair fire e repeat tem Pice and rolls Set 6 to 00 for equial Lion at Corona 68 New York

WE start you tree in his profit business of your own. Take orders for exclusive cabinet-conceased safe \$12-\$24 per talk Free Ett. Free Safe Offer Exclusive opportunity Write today John Brush Co 555M West Ave., Rochester 11, New York

BIO Profits — Stamp Social Security Plates Key Protectors Sample—50c. Catalog Free. General Products, 184 PS State Athany 10. N Y

#### 4 MIGH-GRADE SALESMEN

FOUR Ires copy of World's biggest sales magazine tells you how and where to make more money on your own in selling write Specialty Salesman Magazine, Deak sis 307 North Michigan, Chicago 1

MARE Estra Moses Big Cash Commissions plus premiums for some and sear customers Sell Advertising Book Mares customers Sell Advertising Book Mares Commissions Comm

IF you're interested in making money in sciling see the hundreds of exceptional the function in Success of exceptional the function in Success of the Succes

MARCE Exize Money selling at the conmatchbooks Proc catalog and the re- of Manhacip Deat Pro- of a con-

MAKE it a M nes T procedum second so the life of de nome? for the No test then treds and so the free National Credit Desk 3, Pake of Bidg Kansas City 6, Mo

41.000 00 A month for making dramatic 3-second demonstration of amazing lightweight Presto Piro Extinguished New 121 al used by Airforce smalls out fires auxiantly Only 14.85 Terrific commissions, Millions with it Pres Kit, Merlite, 114 E 32nd Dept P66G. New York 16

#### EDUCATIONAL & INSTRUCTION

LEARN While Asleep with your recorder

to a spirit and a continue of the live of the live

BRUKKETPERS In rease of the lines the are of the temporal by the A Week Brukker, in the lat Mers of the Property of the Box 301 Cedas Grave No. 2 of the Control of the Con

HOW To Train Horses? A book everyone will kee priest should have hime
No no sa op 5 m will est file a
School I H segment up Dept 5612 Piens
of H & CK m

UNED Correspondence Courses and Broaks and and ret ed Morre back gonear ee Calaig free (C., es Boughs) Lee Mou as Pisgah Aubumg

RE a Res. Astate Broker Study at Rome Wir e for Free book ticks til an proved. Weaver School of Real Estate 2018R Grand, Kansas City Mo

MASTER Watchmaking at home Free tample leason Chicago School. 2328 WY Milwanker, Chicago 47 STUDY For Doctor's Degree of Psychology Metaphysics and Divinity Correspondence courses only College of Divine Metaphysics, Dept. P.S. 2011 North Illinus, Indianapolis 6, Ind

SECOME Tax Consultant. Graduates cara \$1,000 \$3,000 every tax season preparing returns evenings State approved Union Institute, Lakewood 1P, N J

CUMPLETE Your High School at hime in the end of a record Tests form and No leases D. oma In It make broken for Amer up behalf De. X846 Direct at 55th Chicago 37 academa.

WANT a Diesel Job? Higher pay? Advancement? We can help you qual.?

Care Diesel Tractor a d Heavy Forest and Cumm is Diese, Engine in the inches home states to a see available W. F. Iodan 1 to state Training Service Dept. B 2 Portland 2 Ore

ZARN While You Learn Auto and Diesel Mechanics. Muster this top paying trade Many graduates earn \$100 a week and up Approved for Knrean veterans. For free information write Dapt, No 262, Nash-

1 SED Correspondence Courses (Bought and Sold) Money Back Customtes, Cem. Dept. 12-8, Lanwood, New Jenes.

IT's 'ub learning a language by Lordon phone. World's Standard Couvers of al Method. At home, quickly easily lear to stak French Spanish, German, Japanese. It also bring the another country of the state like living the another country of the state readed rounds in Free book and Detain No Obligation. Try son't buy! Linguaphone Institute. T-M-128 Radio City, New York 26

PROPITABLE weed g training and able it has trade 5 hool for P 782 Iroy Ohio. Of approved Finest equipment in U.S.A. Ressoushie prices, Request catalog.

LEARN Civil and criminal investigation at 7 cm Farm stee it 6 mm pa line ste A 1 rd 5 cm e 920 Sunmisside Dept 176 age 40 i cm

LEARN While Asleep' develop Condidence, Dynamic Will Power, Control Tenmon. Weight, Smoking, proven tech it comes Transmiss Sleep ma, un, \$ 60 Brochure on request A.S.R. Founda to Box 21-L. Henry Clay Sta., Lexlist on Kentucky

FINISH High School at home spare the Nica en D ma and ded Write Tree caung Walte folial Catalog HHA B' 2"" Shelled (Leago 4

EARN college degrees correspondence all to lear to a to \$ 5 to ma T for C a second 120 has been Trust Building Indian app a \$ 10 to a

This e The Gard South Minds

FREE General Catalog 100 Pages. Text rocational educational instructional subjects. Milhons of Volumes, new and used Pages. Prices Books bought. Est. 1992 Last College Book Co., Dept. PS, College Dut 1 Ohio.

meta sas or dist of the house of the meta sas or dist of the many peak of the best of the

LEARN Tile Betting at home. Free details. American Institute of Tile Betting Box 2 Daksand 4, Calif was

DiPlacMAN Physics Therapy Massage Drug est Lerapy Institute, P. O. Box 30° Let gb. A. en. Founda

FARM Degree Free bulletin. Homestudy on Midwestern Bible School, 1966 Brading is it anapolis

LEARN Real Estate Business Fast, Unlimited opportunities. Economical homestudy course. Particulars Free, Gordon Howard Institute, 322 Glover Building. Eansas City 5 Miss our

WIN business success by writing letters that sell New Manual by aspert gives you this money-making power \$2.95 postpaid for a sea are Christopher Heanger Court St. East Syracuse. New York

54 POPULAR SCIENCE DECEMBER 1959

PHYSICAL Therapy and Massace Home Training Practice officially or with with doctors and hospitals. Free Catalogue, National Institute, Box 4, 158 E. Ontario, Chicago, Ilanois

ANALYZE Handwriting, Big Earnings 12 Lessons 212, 81 monthly Earnshaw 430 Thompson, Olendale 1, Cal f.

PREPARE for civil service examination and pay for course after securing position. Write Free School, Dept. PS-139. Kokomo Indiaba.

BEORT Self Taught Piano Lessons. Postpaid 21 25. 6633-A Virginia, Kansas City 19, Mo.

'MAIL Order Ideas, Bources, Pitfalls." \$1 00. May change your entire life Publications, Box 117. Maury, N. C.

#### 40 CONTESTS

Will contest money General Contest Bulletin gives hundreds of tips. Lists current contests, rules, Sample magazine 25c. General Contests, 1808-A Rass 5th, Duluth 13 M. at cools

"WIN Prize Contests" -complete book 25c. Greenwood, Box 1114-Ph. New York City 8.

#### 17 DETECTIVES

DETECTIVES Work home - Travel Experience undermany Detective Part rulars free Write Wagoner, P-125 West 86th, New York 26.

DETECTIVE Training. Phillips Secret Service System, 19:7-C North Kenneth, Chicago 30, Ith.

DETECTIVE Profession. Home Study Badge. Certificate Future. Box 41197-G. Los Angeles 4, California.

DFTECTIVE Training — Spars Time Study Pascinating Profession. Men - Women, Rig Money Second Private Detective We help. Laws 50 States, Detective Box 490, Times Square Station, New York 34 E. Y.

DETECTIVE Pinserprint Training Write International, Box 434 Saint John N B., Car ada

#### 48 LANGI AGE OF TRITS

LEARN world interlanguage endorsed by Unesco Pres lesson Experantu, Maddleson, Wascolish

## INFORMATION, NAME LISTS

LOS Angeles classified Examiner and Times attracted \$2.00 Expense foothern Cantornia beautiful photo-closed busklet included Jim Smith. Box 5136, Los Angeles 55 California

#### 81 SPECIAL SERVICES

3 DAY Service on beautifu, personalized Christman ands from , our photo or practive. Write for free sample and information. Lincoln Studies, Dept. L. Box 13, Lincoln, Nebraska.

#### ATTHORS SERVICE

WANT Your Book Published? Learn how we publish advertise promote, distribute. Many successes. Free booklet PS. Vantage. 120 West 31, New York

#### ADVERTISING AGENCIES, ETC., FOR ADVERTISERS

5.000 COLORED circulars 339 Complete Samples Promotion, 345 PP12 Broadway New York City 12

SOMETHING to self! Write its about it and let us help you with a reasolved ad which will reach I make a pote it as customers in the classified Copportant test section of this magazine. Write today to O. E. Kelly Classified Adv Mgr., Dept 1290. Popular Science Monthly, 356 Lexington Ave. New York 17, N. Y.

#### 54 (ARTOONING SIGN PAINTING, CHALK TALKS

CARTOON Your way to success' Internationally known instructor Bare Burns. Will persons at least you to create original sample cartoons at home Cost of Course is very low Write for free de alla Raye Burns School, But 3563-S, Cleveland 16, Ohio. HOW To Make Money With Simple Cartoons'—A book everyone who likes to draw should have. It is free, no obligation. Simple address: Cartoonists' Exchange, Dept. 1917, Pleasant Hill, Ohio

YOU can Entervain with Chark Talks. Catalog 16c. Cartoonist Baids, Oshkosh, Wiles-On

CAN'T Draw? Cartoonizer talentless method with surprise 50c! Bapihol. RJ. 446-13 San June (a form.a

### OFFICE MACHINES

TYPEWRITTERS 15 Nationally Pamous Models, Portables \$73 50 up Write for Pres folder Billis Co Box 278-V South Lyon, Mich.

IBM Electric Typewriters \$49 \$5 Smith-Corona Electric Portables \$149 \$5. Continental Distributing Co., Box 71, Temple City, Carlfornia.

## OFFICE SUPPLIES

6 LINE Pocket Stamp-name, address, phone \$1 00 Two (different) \$1 50 Retter, 44, PS, Troy, Ohio.

2 Lines \$1 00. Cushioned, Indexed. Franklin Printing 4813-A West Minnesota | Ave., Hales Corners, Wisconsin

INDEXED Cushioned, 2 lines \$1.00. 4 or 5 lines \$1.00 (Serips, Print or Old English) Five Stock & Advertising Stamps Critism Type Chart , Day Sect & Youngers Stamp Shop Princeton loss

THREE line, self-inking pocket rubber stamp plants case 11 feets, case 11 50 L. Watson, P. O. Bux 182, St. Charles Illipots

RUBBER Stamps, Address Labels Pres Catalog Martins, 425 Major Drive, Jefferson City, Missouri

PASTER self inking stencil stemp Three lines dollar Adams. 2021 South Rogers. Bloumington Ind.

OFFICE Type Stamp \$1.00. Metal Pocket Stamp \$2.00 Ant 3 lines J R Wa Sah Stamps. Scala, 160-30 Cross Island Pkwy Whitestone \$7 N Y

THREE lines \$1.00 Enob handle cushfoned Satisfact on Guaranteed Clancy, 204-A Swan Providence 5 H. 1

THREE line self-inking stamp \$1.00 Catalog for trefundable, G. Messe, 43 F. Revser W du.

THREE line Porket Case with pad or other age 2 00 W S Atherton. Box 81 Randouph Massachusetts

## MITTIGRAPHING, ETC.

PRFE Ca. alog Postpaid printing Rubber stamps D M Press, Sebastopol Calif OPPSET Printing—24 Hour Service—56 75—1006 84, x11, \$16 50—5000. National Letter, 300 West 43rd St. New York City 36

COLORED or white \$15 x 11 offset 1000 \$. 50; \$.000-\$17. Fast! Promotion, 385 P.2 Broadway New York City 13

1 000 BUSINESS Cards, "Raised Letters" 43 95. Samples. Pioneer, PS-12 Island Park, New York

at Budget Prices. 313 Waverly St., Palo Alto. Calif.

SOX IAL Business Printing 7 setul Surprise Cults Catalog 25c S Smith 1938 Page St., Beaumont, Texas

too ex ENVELOPES, 100 5'228'4 Letterheads printed, \$2.00; Good Quality, M. Fortney, R3. Dillaburg, Pa

PRES Business Printing Catalog, Samples, Howprint 721-W Eunice, Webster Groves 18, Missouri

OFFSET Mimeographing Sampler Prices Free Litho 53 Laurie Fort Walton Bea h Fiorida

PREE Unusual catalog Rusiness, Perconal printing rabber stamps Lowest prints, Barriskill, 1715 Julian, El Cerrito. California

LETTERHEADS, Circulated, etc. Price has Valuable, 1705 South 2nd, Phila 10, Pa.

MIM'OGRAPHING Offset Complete Lettershop Services Samplet Petitional Drawer 14:0 Scranton Penns

1 000 EMBOSSED Business Cards \$1.50 Postpaid, Samples, Ellis, \$900 Highward-view Sylvania, Ohio

500 2.7224 Pour-Line Gummed Stokers \$1.00 Red Berder \$.50 Monte Printer, Sagitage Mark gab

SEND postcard for free samples, prices, Maybeld Box 2011-C Chattanooga II, Tenn

BUSINESS Cards 500 - 12 00 Randolph Press. Box 1406 B Detroit 3 Mich

PRINTING od kinds Catalog free. Hanthorna, 532 Lindell, Payetteville, Arkansas.

#### PRINTING OUTFITS, SUPPLIES

PRINTING Outsite, type, appointed Send dime for thustrated supply book and samples. Kelsey, Inc. II S. Menden, Conn.

S?LK Streen Stenrik Low for prices Quick service. Shackellords, 242 Third, Pituburgh 22, Penna.

RUBBER Stamp Presses, Hydraulic Oprested Sectrically mested Sixes State, \$1.2" 101.5" starting notific supplies. Printing Presses, supplies. Custom Manaincluding 507 M Jafferson, Springfield 2.

PRINTING Protect, Type, Supplies, Lists, 6c Turnbaugh Service, Machanicsbate Pa

MAKE Your Own self-molding rubber stamps and printing cuts. Pseutrubber, Args le 3, Wasconasts

ILLUSTRATED Silk Screen Printing Instructions, \$1.00. Details Free, Plenser Valley Stencils, Box 162-E, Springfield 1, Mass.

RITHER Stamp Makers Supplies. Riewict 2025 Earney Hoad, Kaumason, Makingan

#### FOR INVENTORS

INVENTORS, if you have an invention for as r, patchted or unpatchted, write Instrate of American Inventors. Dept 20A, 435 P St. N.W., Washington 4, D. C.

WE have the markets if you have the ideas. Harvey Engineering, Cambridge 1, Maryland

INVENTIONS wanted now by my Manula-tuter (nents Patented Unpatented Write Gilbert Adams, Pa sot Broker 50 B Wall Street, Pinancial District, New York City

INVENTORS Determine the pateriability of your divention. Sear her of the Pater? Office recurs administered professionality to min \$6.00 for free invention profession forms and dependable service true. Washington Paters Office Search. Bureau 1636 G. Street N.W. Washington S. D. C.

inventous! Consider our offer first before seiling or licensing your invention on a cash or royalty basis. Patented. Unpatented inventions on Domand, 78 Wall Street, New York 5. N. Y

CHEMICAL Inventions, U.S., foreign patents and literature comprehensively searched, \$25.00 H. Jay Specialties, P.O. Box 2311 Providence & R. I.

INVENTORIS - Get The Best Offer First!
Patented of unpatented. Write Carl Sommer Director Industrial Invention Sales,
1.36-B Bylvania Ave., Toledo 13, Ohio

INVENTIONS—Ideas, Patents Wanted' By Manufacturers, Cash—Royalties, Sales Promotion — Invention Development George Spector, Licensed Professional Engineer 3615 Woodworth Building, New York

INVENTORS Don't sell your invention Patented or Unpatented nutil you receive our offer, write Cawgill, Box 284-C, Marion. Ohio.

INVENTORS Save High Pees! Apoly for your Pa ent nurse! New Do It-Young! Paten! & I now makes it easy Pree Registration Form! Miss Care Arden 306 Wm Penn Annex, Philadelphia 5. Penna

BAVE Haif Patent Expense Details free Product Research Box 181, Arangton 18. Virginia

#### MA ENGINEERING SERVICES

ENGINEERING Development Drawings. Todd, Consulting Engineer 424 West 118th. New York 27

PROPESSIONAL Engineer offers servveloping, drawings, blueprints prepared F B Ledermann, P E, 154 Nassau Street. New York 38

#### INVESTIONS WANTED

INVENTORS Handreds of manufacture can have read a gradual strain of the part of the strain from the strain fro

ented. Tremendous Manufacturers : Global Marketing Service, 2420 77th. Oak-

ARE a diction of in affect from real able to a use such a for the Parameter, Parameter, unparented Marky, Engineering The Water of the St. Cambridge, Maryland

INVENTIONS wanted now by my Manufactater C. B. th Pate and U. a.c. ret Write Gibert Adems, Patent Broker, 30 R Wall Street, Pinancial District. New York

INVENTORS! Consider our offer first before selving or licensing your invention satesited liver was on against in West Street, New York 5, N. Y

INVANTIONS breded insided a six for the tion write Kesser Corporation 7121W Fremont Olive

Patent Pending 20 Years to see ence Patent Pending 28 Years ex ser ence Promising Investions National Service By Sad \$122 Merainer St. Louis 18

CASH Bayers for inventions. Write Ha-tions inventors Institute. Box 4125.

INVENTIONS Ideas Pairts a Wanted By Manufacturers. Cosh-Royastice Same Promotion — Invention Development Orders Spector, Licensed Professions, En-gancer, Jail Woolgorth Building, New York

INVENTORS-Get The Seal Offer First' Patented of unpatented Write Carl Som-mer Director is hadred investors Sales Lat B Branden Are. Editional Color

INVENTORS Don't sell your arrestion Patented or Unpatented anti- to 1 - 17 our offer, write Cowgod, Box 200 D Marwa Uhio.

BAYE high fees for se one your inventions Ketchuma Advertise of 1936-C Aprimited Laroni

SUPERIOR promotions. Patented, unpatement directions autorina on book et free Superior 338 342 Morth Roden. Ber-ery R. A. Carlo, a

#### 44 MODELS, MODEL SUPPLIES

SHIP Models. Most complete line in New England, Kits, fittings, plans, books, tools over new one of Linear steel care and 15c James El es and Co Inc Depl PN 342 Atlantic Avenue, Boston 10 Massachinactia

SHIP and parist model 51 mgs blue-prints Send 35c for litustrated entaine \$28 limits buildreds of stems A J Fisher 1002-2 Rtowah Ave. Royal Oak Mi higan

POWER Drives Handbook Illustrating man types motor drives for model auton boats displays turn abororder \$7.00 or mure W sent a of C eveland. Dept PS. P Q. Box 2003, Pt Laudetdale

en PAGE Catalogs, 25c Each, Cutaing "APS33" 20.000 Airplane, Boat, Car Model Supplies, Catalog "RPS34" 20.000 RO Supplies, Catalog "RPS34" 20.000 HO Railroad Supplies Has Free Bonus Offers & Bargains Too, America & Hobby Center 146 West 22nd Street New Tork 11 N. Y.

LIONEL Trains Big Discounts Catalog 25c Mark Stos. 2011 Chicago Ave , Chi-

SHIP Model Kits And Fittings Clippers Schooners, Prigates, Brigs, Plaque Mod-els. Plans. Catalog And Book Last 25c Model Shipways. Box 35. Bogots, New

"ST" Steam Busine Cartings, Pittings Catalog 15c. Ship Models Ltd., 186 Sum-mer And er Mass

ROCKET Supplies, Nomics, Court Truck Specimo At Made Calaing its Sky Mig Co., Mineral Point, Pa.

STAGECOACH—accurate working drawings for authorize righth acute model Wells Pargo coach. Two large sheets, completely detailed, \$8.50 Ivan L. Collins, 10385 Mc-Kenzie Righway, Springfield Oreg in

24" ROCKET-solid fuel high alt tade personal return. Educational Complete parachule return. Educational Complete scale plans and instructions \$1.00. Ad-tance Engineering, Box 2274, Delias 21, Tesas

ROCK-A-CHUTE-Amazing New Mode Guided Missile. Catalog of K ta Parta, Chemicals 25c Central Rocket Company. Dept. R.C., Waupaca, Wisc.

#### HOME CRAFTSMAN

LEARN Art Metal raft at d Jewe ry mak lbs: Complete the censive home many agcourse or a available. Special forts and many au furnished. Wille for five book Is territate a a sing Service Liept L. 2. Portland 12 Ores in

PRES "Do-it-Yourself" Leathercraft Catalog Tandy Leather Company, 1999 782 N30 Port Worth Texas

PAINT Sprayer 7 times faster than bru 214 Separations of a Free Falcer Image, 1829 S State Chicago 18, Dianois

WOODWORKING and Cabinetmaking course for beginning and advanced home craftamen. Only complete low-cost home training program available. Write for free booklet Interstate Training Service Dept. G 2 Port and J2 Oregon

NEW bog altertrated avenue State lies for Leether rall Meta coaft are numer as amail the spensive crafts Prompt shipments. Top values Latest ideas Bend 10c today to J. C. Larson Co., Dept \$336 a20 E. Tripp, Chicago 24

GHANDPATHER clock movements, case place has Whatevale at any she Mason-Sullivan, Nortion 3. Comm

104 J1 in tW Parterns plus asphabet \$1 Jectaff O hallon 4.2 Mc

PROE New plans ratalog Make 2400 things Pun Profit, Craftplans, 1222-B | Wabash Chicago 3

KARY projects Spice rocks, wall holders for bookmatches, sick matches right et.es place & 60 H A Hibinson 2366 Columbia Road Westinke, Ohio

PREE Pluorescent Bargain Calabe Pitts & his Pittaree Clinings, Paris Shoplite, 4505 Franklin, Nutley 16, New

BELT Sander-low cost Easily made from plant. Free literature. Gluple, 121 B

EQUARENCYPTERS Make beite band base an arda des leuches etc Special offer Beninner's book ta'alog and que to to'd samples 25c P C Herwig Co Dept 71-PT 30 Henry St Brooklyn t New York

PREEL Land bur raft ratable. dreds of new terms. Write MacPherson Bros Leather Company, Dept. A. 736 Mis-sion St., San Francisco 3, Calif

KNOCKDOWN cedar chest and himber, free price list. Bedford Lumber Company, Shelbyville, Tennessee.

PREE Leather, raft Catalogue E rkpatrick Leather Company Box 617-A62. On perrile Teams

NEW 2-part Epoxy" chemically bonds anyth he permanently even glass and met ECHA 2 long way Amaze vourself with what vou can repute Complete kit \$3.00 postpaid Money back Guarantee, Send cash, theck or money order to Department L. Rowell Products, 752 Vandalia, 84, Paul 14, Min-

KNOCKDOWN cedar chest over 50 kits Cats et 2sc (1 ico Brownshoro, Ausbaina

STY'ECKAPT Pretraced leather hits Handbaga, Billfolds, Filigree Belts, Patterns on leather Just carve, assemble and lace "Precarved" kits also available Bend 25c for catalog free folder Refunded first order Apache Leather Company, 2804 E. Washington St., Phoenix, Ar.zona.

KILN Dr.ed Wast it Cherry Ric Ha d-woods, Blocks Boards And Equares M Iland Lumber Company PO. Box 262 Savat. at: Mo-

MILE ET Ca penter Aprona For Little Mel co Wass St to 5" v 7" 3 Politeta. 5 Or Duk Crief is w For Christian 5. On Cast Or MO No COD.'s. Micget Lumber Box \$33, Huntington, W Va

LEATHERCRAFT-Leather, Craft Supplies Dies, Emboseing Plates, Copper and Aluminum Tooling, Catalog 25c Louis Jones, 304 Main, Fort Worth, Texas

PRIE Leathercraft Carava Quality Rits, Leather, Tools, Handicrafters, Dept. S. Box 427, Montrose, California Quality

#### DO IT YOURSELF

PREE "Do-It-Yourself" Leathercraft Catalog Tandy Leather Company, Box 791-X32. Fort Worth Texas.

PLAYER Pla a Repair Manual I have trateo \$2.00 Studele, stoll Hoge Dayton of Onto

CLOCK Movemen a Grandfather Juli-lor Duda, Parta, Catalog 25; S Franklin, 7518 Oak Ave. Me rose Pack 26. Pa.

Middle The Leathererte Unbolstery Suit es San les Maktansky 1867 Town-se d'Ave New Yo X 52

#### OLD COLD TEMPLIES. WATCHES, S.TC.

USED and new watches \$2 up. Fron List Southern Walches, 5-P8 So. Wabash Ch was J

FREE catalog Costume jewelry parts of the catalog Costume jewelry parts of the catalog of the ca

COSTCME Jew-fry Supplies Settings. Rhinestone et: M page Illustrated cu'a-les 10: M andy Box 1328 Q P.O., New York City (fr.

SWISS untiles from Importer 42.05 p. Cathon Transmill 565 5 Ave.

haby to assemble costume lewelly for trated entring with instrum line 11 Gata-les on a 56. Acts neste covarions P. Q. Box 80 A. New York 34. N. Y.

5t.PPLIES to make we show and contume jewelry. Free catalog, designs, instructions Modern Crast Box 11068-EP Saint Petersburg 33 Justice

10 SWIRS Watches \$18.00. Catalog 25c Berkowitz, 1150 Castlehill, New York City

GOLD 61 ver Platinum- was her spectactes jewesty and testa. No oblight in to Sell Send me no for Best Price Kierten Company 1942 Highland Avn., Buffalo 23.

#### FOR THE HOME

FOAM rubber furniture cushions-Facsers mesenda pu discount Free fatable Perma Posis. 200-A Ryo Ave. Irvington. New Jetsey

HEAT your home for almost nothing Details on request Ottanqueches Prodbiss. Quechee Termont

#### 76 OF INTEREST TO WOMEN

MAKE \$25 to \$35 weekly addressing enresopes Our matturities a revea, how Glenway Box 6568. Cleveland 1, Ohio

CAKE Decorating Amazing New Meth-od Detain Free Decorating Institute. Box 648M Waningh, N. Y.

28 VALENTINIES Only 15c Make biggest money showing friends best greeting card Mothers, Fathers Day, Easter, Burthday, Everyday Assortments, Gifts, Stationery Samples on approval Send 25c for Valentine Special, Midwest 1113 Washington, Dept 651-R, St. Louis 1, Mo.

DISTINCTIVE Cifts—Rousehold Items Catalog Free, Rayborg's, \$18 West 18th, Erie, Penna

HOW To Make Unustal Gafts and Extra Money With Wall Tiles, \$1 00. Ganney, 165 N Wabash, Chicago 1, Ill.

ADDRESSERS wanted, Write Hughes Advertising 46 E. Broad, Shillington Pa

BEAUTIFUL Pash one Low Frices Cavalog 25c (Refundable), J. Nutt. Box 337 Penn Yan 2, N. Y.

#### 11 FOR SALE MISCELLANEOUS

POLISITED Cypress Knees For Lamps, Ornaments, Olfts, 4-10", six assorted 55 75, postpaid, Guaranteed, Gippler's, DeLaun Springs, Fla

TOTEM Bay Import Gift Club. Each month a lovely Import is mailed. 3 months \$7 50, 6 months \$15.00. I year \$24.00 Totem Bay Traders, Box \$24. Ketchikan.

CLOSE Out-Imported Alarms, New Morchandise, Pire Or Burgler, Battery Operated Very Loud Useful Pocket Purse Rems Adding Mark 1 c. And S. bitracts. Check Proceeds Picterts Names An act Adarm School Off Bound Tiref Moses or Buttanata Any Rem Mensy and \$1.00 Props of Harnd Bankty 40t Darlor Philadenton 40 Pa

PROPPING Bag fishnet design, plastic lateres J. 00 Pres deta's IFA. Box 8051-A Busta Barbara Cast?

FIFTY personalized from on Clothing Labels Send Dollar Siy s, 4381PS Lake, Rochester 12, N 2

#### 11 WANTED TO BUY

QUICKSH.VES pratinum at ver, gold Orea a a red Mercury Terminal, Nor-a and Massa quaetta

#### 73 WEARING APPAREL

5KYSCRAPER-Reel Shoes, Wasp-Wa sted Corsets Photo Catalogs, \$2.00 Pinecraft. Box 442-Y Rellywood 28, Calif

#### 74 HAZOR BIADES, BHAVERS

D.B. Blades, None Better 61 00-100 Blades W-B Bales P.O. Box 653, Whitee-Barre, Pennsylvania

PHEC Plastic Kit for liceruse photos with 320 ts or blades for \$5.30 tampie of data is March to State Pick 2774. Areade Station Nach to be Telesiases

#### 15 TATTOOING BUPPLIES

LEARN profitable, fascinating Tattroing Lowersted information \$1.00. Zew -2 B Leage, Rockford, I - may

#### 74 ARTISTS SUPPLIES

ARTISTS - Dealtamen Build This Ultra-Mourin Drawing Table Detailed Points 41 00 Cummer, al Art Service, 1666 Ban Anseline, Long Beach 8, Calif

## 17 GEIGER COUNTERS & TREASURE FINDERS

TRANSISTOR Pressure Detectors, underwater detectors. Many models Free ca a ser Charle ner Electric as C. Dept. 1, 2545 East Indian Scribot. Phoesia. A. Isona.

MONEY for you in buried treasure come good, where—can be found with a Condak Translatorized Locators. Five modris including Underwater Locator priced from \$79.50. Free literature . . . Authentic books of known treasures averable Goodak Company, 1540 West Glenoaks Bivd., Glendale 1, Canfornia.

G 'LD-Silver Detectors, Geiger Counters | Violates for tungsten, etc. Best available Outranteed Information Free Detectron, Dept. 48 Sylmar, Calif

UNDISCOVERED Wealth, Transstorized M-Scope detects gold, silver Jewelry etc Laghtweight, guaranteed From \$59.50 Far Terms Free Ca alog Fisher Rasearch Dept C 2, Paio Atto, Caul

METAL Locator Kits and Assembled Models from \$49.00 Transitionized and Underwater Models Available Free Catalog, Electronic Applications Dept. 5 Box 4 Arkington 10, Virginia

TREASURE! Map, Handbook 25c Localocs, Howe, \$11 Kansas, Atchison, Kansas TREASURES Located Treasurescopes, broks magazines, maps information Treasure Sunters, 2022-164th, Plushing 54 N Y

#### 78 WATCH REPAIRING

WATCH and clock repairing books. Prescatalog No 'h American 22.5-BM Mil-

WATCHMAKEPS Jewelers Lagidaries Catang 25c Bengal, 4912 Venue Culter Cay Camfornia

WATCHMAKERS' Tools, Materials, Supp. Ph. Wa her Unitaring Claims, Box 1000 Claims of Tools of

WATCHES repaired cleaned, \$1 25 graranteed Lan's 17 South Cen er American Fork. Utah

WATCHMAKERS Journal contains instructions in watch repairing Sample copy 25c. Dean Co., Box 12:8-8. Daytona Beach Fig. :a

#### 9 MINCETT ANEOLS

ELECTRONIC Sleep Inducer Completely harmless. From literature Gardiner | Electronics Co., Dept. 26, 2545 East Indian | School, Phoenix, Arizona

CHECK the validity of arguments with the Meiser Validascope, a don in a conceated logical calculator reduced to 1° of postpaid Dr John Melzer Professor of Philosophy Auburn University /API/ Auburn, Alabama

OLD Original 1903 deak telephones. Working order, oak crank ringer, box included \$5 each, f a b. Telephone Company Turtle Lake, Wisc.

ORNAMENTAL Iron designs. Book of 1780 beautiful, practical designs for rall- ( ings, columns, etc. Free literature, Cun-culminam 3331 South 2200 West Ph 2., San Lake City 4. Utah

COLORCADE Water Pountains. Automatic Stroboscopic Color Effects. 309 Delawate. Berkeley, California

RECEIVE Mails. Catalogs. Magazines. Year 25c. Perland, Box 953-E. Brusol. Conn.

HOMERREWED wines, beers" Complete instruction manual— \$1.00 Dean Products, Box 40-PS, Elberton, Georgia

EXTRA Sensory Perception. Diviningred, Pendulum, Earthradiation. Concerns you. Startling information Free Radiesther a Research Dept. A. P. O. Box 41222, Los Angeles 41 California.

WHILE Car Suppl Lasts Recharge able Sasbiunts out \$2.95 M Gaiser 1105 W Mu berry St Kokomo Indiana

MIRROR-Transparent back Watch photograph people settetly Binie' 82 to 16'120' 85 00 One Way Mirror P5-1130 Box 625 Mt Vertion, N. Y.

PLANS 48" about moral Brake 13c Carose in Box 31 Baden Station, St Louis 15, Mo

CFSSPOOLS supile tanks, all clogged drams cleaned, decider sed by new corsine product. Seves annual pumping disgrap etc. Marmess to pumping petr or people film; ly Bush through thilet. Six months augmo only \$2.95. Matted at such a in t. S.A. Electric Sewer Cleaning Co. Ail aton. 24. Mass.

RECEIVE—Magazine Samples. Matis Camerure Pargains From Frerswhere (ret Listed 25c Rurick's, Cincinnati 26. Ohio

PEATHER Picture, Artistic Catelog, Papaya Seeds Mc. Pronton, 1104, Calexico Calif

RECEIVE opportunities Bargains Samples Permanent International Lasting 25c Mecko's, \$611 Lanarkshire, Dailas 18 Texas

MAKE Big Money Selling Books by Mail' Free details. Write today! Direct Mail Service. Dept. PS. Box 561, Bakersfield. California.

RECEIVE make, magazines, tamples Your name to numerous making lists 25c Greenwood, Box 1116-MW, New York City 8.

#### PERSONAL

MEXICAN Legal Matters, A Espejo, Box 134, Hermosillo, Sonora, Mexico.

PSORTABIS Sufferers Discouraged? Here a help! You pay nothing unless satisfied. Free details. Pixacol, Box \$863-SP, Cleveland 18 Onto

TROUBLED! Love? Money Problems? I'll help. Solution available, if instructions followed. Strictly personal. Warnsteker, Box 12-P. Ottery Cape. South Africa.

BORROW By Mail \$100-\$600 Anywhere. Air Mail Service. Postal Finance. Dept. 4 X 200 Keeline Building Omaha 3, Na-

VITAMINS Send 31 00 for Special Introdu to: 90 Day Supply Multi-View Spilar frame as cost 35 00 retail Free Catalogue Guide-Book Included, Vitamins, Br 4435-E, Philadelphia 40, Pa

PORTIGN Remail 50c. Monthly \$1.00 Shylock, Box \$30 Solna 8 Sweden

VICTIM of Nerves? Are base one fears, worries, complexes, keeping for out of your life? Freedom, Personal Power may awar you through I steps to Attainment Ame ng couls Defeat free Uleary Publications flox 7156 H 2. Hastimore 18 Mg.

PROSIEMS Solved Free Internlare Write Zahr M Vollmer, 55 Washington St Denver 3, Colo

THEILLING Your Life Annivan Free Literature 122-A East bill, Escondido Canf

FORGETFUL?? New unique Service. Details—10c Joby Box 21, Vanderveet Brooklyn 10, N. Y

RELIEVE Arthritic Pains Backsches Sore Feet Guaranteed, Pensue, Scranton 11, Fenna.

X-RAY From Stagger of power Adul - Write Clarton, Bux #308-X8, Chi-

TOUR handwriting reveals you! Handwriting analyzed by Certified Grapho Analyst plus illustrations of how \$1.00 Marvin Wisco Jamestown Alabama

LOANS By Mail, 636 To \$600 For any purpose Employed men and women eligible Confinertian 2 cars to remy Write for free loan application American Loan Pan Cit Natura Bass Dept PS-11289 Omana 2 Neoraska

S. PFR memory oversight Success guara teed Bijon, Box 1"27 V Hollswood 26 Cal f

JOIN Ministers Association. Qualify for License Or Luc' on Piec details Auros Central Valley, New York

MEXICAN Law Attorney Centeron. Aptn '9-Cd Junes, Chih Mexico

MCMPRREWED Wines, Etc." Complete Book 5 to ABC Publications, Box 346 San 2 can seen 1 DR, Can furnish

#### 86A REMAILING BERVICE

CIRVELAND Onto Remais 25c \$100 monthly Doctor & Service, 2700 Washing-

ATLANTA Hems ling \$1.00 each flates on quantity. Box 18474, Atlanta 26, tero 818

PABLICUS Flor da Keva matting add cas Min hiv \$4.00 Letters remained its J by inger Box 17, Key Largo, Florida Ke a Fiorida

SECRET Mail Receiving Porwarding System 34 Month, Redgoeth, Box 636, Alhambra 34, California

SOUTH America Remark 25c Antonio Pulhe Apartado Esta 4074, Caracas Venezuela

REW York Remails—25c 43 00 mon.hir Sunday Times Classifieds—\$1 00. Joby. Box 21, Vanderveer, Brooklyn 10, N Y

MIAMI Remails 25c each. Forward.ngrecever 21 00 mon h v 4 dts, 26720 N W 10th Road, Miami, Florida

MAIL received forwarded 25c letter 43 00 Month Lloyd Moffitt, 2911 M. Fingler, West Palm Beach, Plonds

#### SOB LOUND BY MAIL

BORROW By Mail. \$100-\$600. Anywhere. Air Mail Service. Poetal Pinance. 221 EAC Building, Dept. 11-X, Denver 2, Colorado.





#### NEW LARGE MODEL FOR ALL MOTORISTS

- Flashy is the red warning light that may save your level and's life.
- Flashes appreciantely 72 times per mirello—con be seen for considerable distance.
- Always ready—shaps into eigeratts lighter sacket with cord to reach all parts of the car—ap fectionism to wom not.
- Large rubber section cup firstens in car or road.
- · Finally is mater-proof-se motel to truck



Shipped pertpaid, lockeding taxes.

Specify 6 or 12 vott model

Catalog

Specify 6 of 12 volt model (
Satisfaction guaranteed

A. G. BUSCH & CO., INC.

Flashy



Statement of Ownership, Management, Circulation, etc., required by the Act of Congress of August 24, 1912, as amended by the Acts of March 5, 1933, and July 2, 1946 (Title 39, United States Code, Section 233) of Popular Science Monthly, published monthly at New York, N.Y., for October 1, 1939.

1. The names and addresses of the publisher, managing edit as and business manager are Publisher, Popular Science Publishing Co., Inc., 355 Lexington Ave., New York 17, N.Y., Editor, Howard Allaway, 355 Lexington Avenue, New York 17, N.Y.; Managing Editor, Frank Rowsome, Jr., 355 Lexington Avenue, New York 17, N.Y., Bostocat Manager, Robert D. Bens, 355 Lexington Avenue, New York 17, N.Y.

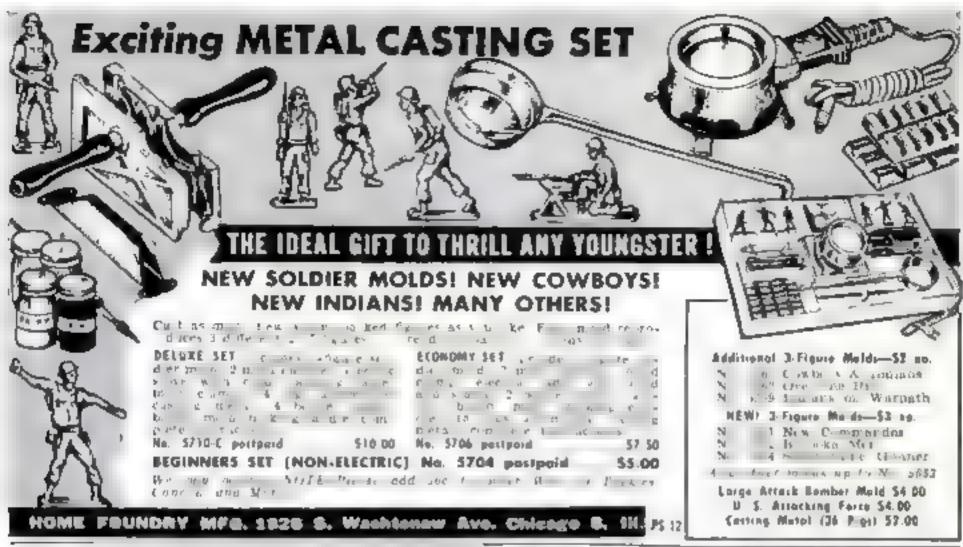
2 The owners are Popular Science Publishing Company, Inc., 355 Lexioston Avenue, New York 17, N.Y., Stockholders of Popular Science Publishing Company, Inc., Manuell and Company, 45 Walt Street, New York 5, N.Y., Marguerite N. Cole, Round Hill Road, Greenwich, Conn., Robert D. Cole, Round Hill Road, Greenwich, Conn.; Novem S. Capen, Capeswold, Bedford Village, N.Y., Ada Bell Wilson, 683 Springford Ave., Summit, N.J., Irna V. Harmond, I Carstensen Road, Scaradae, N.Y., Godfrey Hammond, I Carstensen Road, Scaradae, N.Y., Marguert Clemon, 49 Woodbine, Larchmont, N.Y.; Marguet Clemong, 12 Overlook Drive, New Canana, Conn.; Jean L. Cole Van Buren, Grosset Road, Riverside, Conn.

3. The known bondholders, mortgages and other security holders, owning or holding 1 percent or more of the total amount of bonds, mortgages or other securities are: none.

4. Paragraphs 2 and 3 include, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting; also the statements in the two paragraphs show the affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner.

(signed) Eugene S. Duffield, Publisher

Swum to and subscribed before me this 16th day of September, 1959. Esther Eyl Talbert, Notary Public, State of New York No. 24-9276475. Qualified in Kings County, Certificates filed with: New York and Kings Co. Clks & Register. Commission expires March 30, 1960, (Seal)







## 524.95 Dacron Insulated Undersuit

★ Keeps You Wormer in 67° Below!

\* For Munters, Outdoor Workers, Policemen, Farmers, Men Over 351

Mir needed cash to pay back bills. Thoroton's came them with gigantic order at far below usual whole-sale Brauly? You get \$24 85 Darron links atod 2-pc. andersout for only \$8.65 Peachtewaght—yet keeps pop warmer than be by stehy work underwoar Shrinksproof. Wanhabis Won't mat or bunch. Mothorod. Can be worn in normal room temperatures \$00 000 understatts sold! Small Medium Large Sales 123 Thoroton Understatt \$3 88 plus \$7c postage. Total, \$8.55 Prempt delivery, COO's \$1 demosts. Money back Eugrantee

Super Special! Decase Triple Card Model only 14 105 Order by No. 3 1 D \$10 84 comts e.e.

THORESEN, Inc., Dept. 7-N-333

583 Water Street. New York 2. N

Re-Power NOW with a V-8 or 6 Cyl engine-Use Ford - they - Mercury CMC - Port - Stude Doogs or Plymouth in Jeeps - Decesters - Sta Wan. Trucks Raiser & N. J. cars. Conversion hits \$45.35 to \$58.90 Want last action? Give us full information send \$15.00 Dec and we will ship correct kit. Ball CQQ Send full amount for prepaid shipment. Wire, phone or write feday, Octalia FREE.

HOOSIER MACHINE PRODUCTS CO.

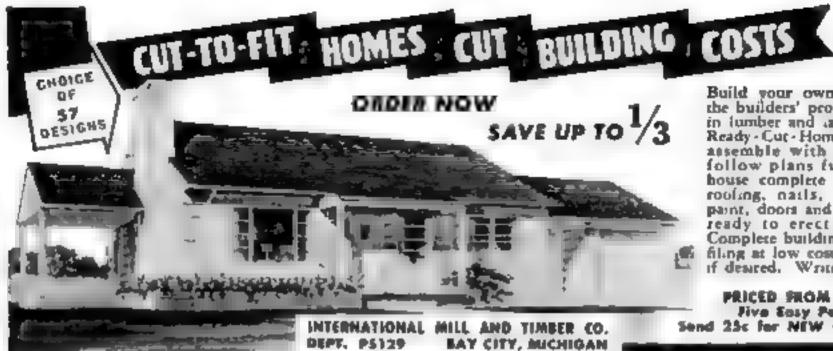
314 H.H. Gib St. Phone CR9-3442 Feedleton, Oreman



# **USES 4.4 MG. POWDER CHARGE**

This small bare gun shoots 12 cal. lead bullets fined by small 4.4 mg powder charge. Not a CO gunt You'll like the handsome lines, grip, and balance. Western in style, but patented ball and coplaction allows this low price 934 steel barrel cased in knurled styrene stock, averall 1312" Develop p-stol form, accuracy at a fraction of cost of large caliber pistors. Comes with 50 lead bullets. Satisfaction guaranteed. Send \$3 to

HAIG MFG. CO., Box G-27, Alham≽ra, Calit.



- 18 Ft.

Build your own home and save the builders' profit — plus savings in lumber and abor with Sterling Ready - Cut - Homes Anyone can assemble with simple, easy to follow plans furnished, Every house complete with all lumber, rooting, nails, glass hardware, paint, doors and windows marked ready to erect Freight paid. Complete building plans ready for filing at low cost. Sold separately if desired. Write today!

PRICED FROM \$2150 UP Send 25c for NEW COLOR CATALOG

## 50 Models

\$41.95 Up, Frt. Pd EASY TERMS FREE 1960

Cruisers, rungbouts, convertibres, fishing, Pre-assembled, pre-formed units. Perfect assembly by anyone, Equal factory built. Save you 🌿 to 🎮 Catalog has natural calor photos, details, point, trailers, accessories, Fiberglass supplies, WAITE

# TODAY.

Dept. A-17, 9200 Access Rd., Minneupolis 20, Minn.

## ARMCHAIR ADVENTURE CAN BE EXCITING



With a NATIONAL NC-60 SPECIAL Shortwave Radio Receives: you can explore the four corners of the earth, sail the seven seas, cross, in the comfort of a favorite chair, the six continents to visit 260 foreign lands. Enjoy standard broadcast too, with this powerful new radio receiver. Suggested price only \$59.95. Write for literature and name of nearest dealer.

## JOIN THE NATIONAL ASSOCIATION OF ARMCHAIR ADVENTURERS

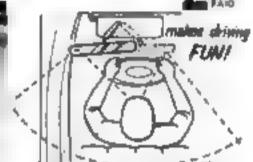
SEND 50c for membership certificate and exciting new book on shortwave listening-tells when, where, how to listen, provides log for listing countries you hear. SEND 50c to:

A wholly owned subsidiary of National Company, Inc.

A MUST FOR CAR OWNERS!

Special Offer BUY





For the first time! New a-lane mirror lets you see ALL the action behind ANO alongside your car . . change lanes sofely Don I twist your head the old way just glance up -slightly Located claser to your eyes than ordinary mirrors -more than troles vision, "Socket-ANO-swing arm" clips on all auto visors - no installation necessary. Adjustable all directions. Cuts glans. Guaranteed. Send \$2.98 to: 5 & R RESEARCH, Box A-14, San Gabriel, Colifornia

> FIGHT TUBERCULOSIS

CHRISTMAS

SEALS



ON LETTERS AND PACKAGES

### 100 % All Wool U.S. Navy TOQUE DICKEY



MOW ONLY

STANDARTHER HEW SHARE VIEW

A real comfort in Cold and Damp weather Pits everyone, Men, Women and Chridren Keeps Ears Neck and Chest warm Soft. Durable Plexible. Comfortable. Converts any jacket to a parka

SEND SI TODAY (Servy no C.O.D.) SPECIAL & for \$5 Postpald

A. L. ROBBINS 36 BOWERY, Dapt. P.S., NEW YORK 13, N.Y.



## Delta POWER-KINI

THE COMPASS TOUR COPY ш ď

EN BROWTHAL GOLDON SILVER

A jeweled, precision instrument—deeignad for modurn care. Full, Indirect Illumination. Sharp, close letters. Silver or gold Calabrity models \$7 43, standard medels \$5 95, Ifluminated \$6 95 APPROVED BY AUTO MAKERS Fine Quality Compasses for over 31 Years

BINEMORE INSTRUMENT CO 1804 43 Kelse &t Flort 1, Mich



Writin far Palder

SPECIAL

### BLOWGUN SET for target and hunting

This omezing gun has accuracy like a rifle Compression of breath in barrel gives terrific ein power You won't palieve your REPORT

person-cum hit a 7 bullseye of 10 ft, Excellent log shooting small game. Partarget full with friends set up in pario of den. Set includes four 5 - steel dorts, 4 suction as target darts, range target. Extra set 10 darts 34, Satisfaction guaranteed At sports dealers at send 1 99 to. WHAM-O MFG. CO., Sax [0-T] San Gabriel, California



BRAND NAMES FOUNDATION, INC.





GIVE CROSMAN CO2 GAS PELLGUNS

Mother, Dad, Sie and Bill . . . all can enjoy shooting fun the safer, Crosman power-without-powder way, Crosman's controlled range and power and top target accuracy lets them shoot anytime, anywhere, all year long . . . in the family room, basement or backyard. A wide selection of single-shot rifles and pistols, repeating rifle, and western style single action six provides the right gift gun for everyone,

#### GIVE HAHN CO2 GAS BR GUNS

Give the wholly new BB guns with higher BB power and accuracy. Feel, look and handle like the famous rifles and pistols of the Old West. True fast draw single action in the revolver . . . authentic lever action in the rifle.

Look for Crosman-Hahn Sales Center at your Crosman Select Dealer. See for yourself what fun it is to shoot the Crosman power-withoutpowder, CO2 gas Powerlet way.

WRITE for free, colorful shooting fun literature. Crosman Arms Co., Inc., Dept. PS-36, Fairport, New York.



WORLD'S LARGEST MANUFACTURERS OF COZ GAS-POWERED RIFLES AND PISTOLS By Ken Fermoyle PS Detroit Editor

## Ready for Spring: Ford's Less-Compact Compact Car



Ford's second compact car, the Comet, will be introduced by the company's Mercury-Edsel-Lincoln division next April or May. Larger than the Falcon on the outside, it will have a 114-inch wheelbase and will be about 195 inches long from bumper to bumper. (The Falcon has a 109 5-inch wheelbase and is 181 inches long.)

Interior room will be well nigh identical to the Falcon's, however. That means front head room of 33.9 inches and leg room 43.3 inches, among other figures. This will result from use in the Comet of what is essentially a "stretched" version of the basic Falcon body. Stretching will primarily involve the trunk. It will be 54.5 inches long inside from front to back—six inches longer than the Falcon trunk.

The Comet engine, a six, will be mounted up front. Some reports say that it will be identical to the Falcon engine; some that the Comet's will be basically the same, but with larger bore and/or stroke to give it slightly more displacement and horsepower. The latter seems probable, since Comets will weigh at least 100-150 lb. more than equivalent Falcon models.

Styling will be quite Falcon-like amidships, with Mercury and Edsel overtones at front and rear. Three body styles will be offered—two- and four-door sedans, and wagons.

M-E-L will bill this big small car as "the aristocrat of compact cars." According to a back-door source, they're shooting for a price—including delivery charges and taxes, but minus accessories—of \$2,175 for the cheapest model.

A GM compact, too? Spring introduction of a second compact car from General Motors—through Buick, Olds, and Pontiac divisions—appears more likely now that Ford is committed to an early release of the Comet. It had been the feeling in Detroit that GM would wait until next fall to unveil the B-O-P compact job—allowing time to check market reaction to compacts announced this fall. The Comet may force GM's hand, however.

When it appears, the B-O-P car will have a front engine,



## Tops under the Christmas tree this year...

because it's tops in appearance...
tops in performance. There's so much
new about the sensational Topper
that we can only touch on the highlights. Things like automatic Scootaway transmission... finger-tip handling... silky-soft ride... sleek
lines moulded in fiberglass... stopon-a-dime brakes... 100 miles to
the gallon economy.

Advice to Teenagers: When it comes to combs and scooters, never a borrower or a lender be. Instead, start dropping hints to Mom and

Harley - Davidson

MOTOR CO.
MILWAUKEE 1, WISCONSIN

Dad about the new exciting Harley-Davidson Topper.

Advice to Parents: Go see your Harley-Davidson dealer and learn more about young America's safest, most responsible transportation... or mail the coupon for free folder.

HARLEY-DAVIDSON MOTOR CO. Dept. PS, Milwookee 1, Wisconsin
Send me more information on the
Harley-Davidson Topper.
Age
Address
THE RESERVE THE PARTY OF THE PA

very probably a small displacement (about 225-cu.-in.) V-8, driving the rear wheels. It will have a slightly shorter wheelbase than the Comet. about 110 or 112 inches. It won't, as some reports have indicated, be simply a restyled version of Chevrolet's Corvair with the engine moved up front.

Cut rates for compact cars. Allstate Insurance Co. has announced a 10-percent cut in premiums on small cars. The discounts apply to bodily injury, property damage, collision, and medical coverage State agencies in California, West Virginia, Illinois, and Montana have already approved the new rates, others are expected to follow suit.

Allstate studied the accident rate and damages of smaller cars, decided the risks were less. Their lighter weight, slower acceleration, smaller glass area, and greater maneuverability were among the factors considered

Allstate sets three limits on compactness weight—no more than 2,750 pounds; length—not over 200 inches; price—not more than \$2,300 F.O.B. (or port of entry for an import). The second-largest auto-insurance underwriter in the country, Allstate is the first to take the step. You can expect others to follow.

The first electric truck built in the U.S. since 1933 is now being used to deliver milk in Warren, Ohio, Built by the Cleveland Vehicle Co., of Cleveland, the truck has a range of 50 miles daily (with 450 stops) and a top speed of 40 mp.h.

The Warren Sanitary Dairy bought the truck after a one-month test of a similar vehicle on dairy routes. The test vehicle covered 468.4 miles during the period and used 890 kilowatt-hours of electricity. Average daily cost was just over 25 cents. Maintenance included one grease job, refilling and recharging the batteries twice—for a total of three manhours of labor. Cost of the truck: \$4,500.

Dacron for tires? The synthetic fiber, used so widely in wash-and-wear clothing, might find a huge new customer in the tire industry Experiments with it as a tire cord show strength equal to nylon, but without nylon's proneness to flat-spotting, or "morning sickness." Dacron costs more than nylon—but if its advantages are big enough, you can bet this will be

Boost for the wipers. A vacuum-operated windshield wiper that performs like an electric job is being used on 1960 Ramblers. It has a piston-type booster pump, instead of the diaphragm type normally used. Result: The wiper blades won't poop out just when they're needed most—when the car is accelerating, passing, or climbing a steep hill. Why didn't Rambler just switch to electric wipers? "Batteries have enough to do in today's car as it is," said one American Motors engineer. Lower cost was another factor.

overcome.

# YOU'RE MONEY AHEAD

WITH U.S. ROYAL



LOW PROFILE TIRES

Radically New U.S. Royals
Give You All These
Premium Features—Yet
Cost No More Than
Ordinary Tires!



2 HIGH-SPEED ENDURANCE
-3 times bettert



3 ECONOMY

-6 to 12 extra miles

per tankful!



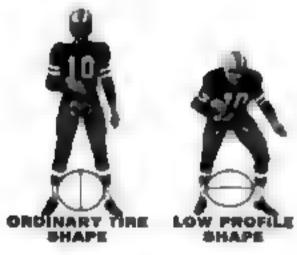
TURNING EFFORT

-20% more stability
on curves!



5 SKID RESISTANCE





Low profile tires are as different from ordinary tires as the two football players shown at the left. Notice that one fellow is lower, wider, harder to knock off his feet. In the same way, new U.S. Royals are lower, wider, more stable. Built to roll easier, run cooler, give you greater safety and longer mileage

on today's tire-killing superhighways. There's a Low Profile tire to match your budget...at your U.S. Royal Dealer's!



U.S.ROYAL TIRES



United States Rubber

Rockeleller Center, New York 20, N. Y. In Canada Dominion Rubber Company, Ltd.
See things you have raw before. Visit U. S. Rubber's new Exhibit Hall. Rockefeller Center, N. Y.

"MEN INTO SPACE," Lucky Strike's authentic new series (Wed. nights on CBS-TV), captures the drama, the excitement, the suspense of man's struggle to conquer outer space.









Never before has a film TV series attempted to tell the true and thrilling story of man's plunge into outer space. Every episode is a dramatic portrayal of adventures and experiments actually taking place today and planned for tomorrow. Lucky Strike is proud to bring this amazing and compelling show into your home.





BLL LUNDIGAN sing of "MEN INTO SPACE"

A MAN'S HORIZONS may change overnight. His tastes don't. The man who wants the honest taste of fine tobacco finds it in a Lucky Strike—and he always will. This is the cigarette that made fine tobacco famous . . . the one with the taste no other cigarette can touch. Remember how great cigarettes used to taste? Luckles still do!

# Get the honest taste of a LUCKY STRIKE



It can happen to anyone—and it's no time for panic or indecision. Here's what you should do . . .

# If You're First on the Scene

By E. D. Fales Jr.

OU'RE driving home from a weekend jaunt when it happens, It's night. The fellow shead hits a curve too fast. He skids, panics, locks brakes. Now you hear the long scream of tires. He goes sidewise, hits a culvert with a sickening sound, then rolls.

You're out of your car before you know it. There's dead silence. The other car lies upside down in the road, headlights still on. A cloud of dust floats over it.

You pause, sick at heart. You look

## Afraid of fire, rescuers may start hauling the victims

hopefully for other cars. No one. Several breaths later you realize: A life-and-death responsibility has been nailed on you—a responsibility you don't want. Four people are trapped in that car.

What do you do now? You're going to be what police call the "first-on-the-

scene."

Your first instanct is: "Get them out!"
Afraid of fire, most motorists run to the car, start kicking out glass and hauling

people out.

This is where they make their first mistake. Highway rescue experts estimate that 80 percent of the people hurt on our roads are pulled out of cars by frantic rescuers—and many are made worse, or even killed.

Every crash is different. And so there are no rules. But to hunt out basic facts that may guide you if you become "first-on-the-scene," the writer recently spent many hours talking with groups who have become expert on what to do at a crash scene, These are New Jersey's unique "rescue squads"—Red Cross-trained teams who roll out to accidents just as firemen roll to fires.

Working with me was Asst. Prof. William Toth of the New York University Safety Center. We talked to rescue squads in Milltown, Hightstown, and Highland Park—all in one of the world's

busiest "accident areas."

Here is what these experts say:

The first thing to do at a crash scene is: Park your own car some distance from the scene, to protect it and allow an "escape path" for vehicles that may approach the wreck scene too fast. Now, turn off the key of the wrecked car to prevent fire, Rescuers say too many

motorists forget this simple precaution.

The next thing to do: Stop for a moment and think, What else can happen? How can police be notified fastest? Is anyone apt to die before he can get medical help?

What about getting people out? By talking to people in the car, determine if any are unhurt. Assist anyone



who is not hurt out of the wreck. But if any complain of pain, or are bleeding severely, or are unconscious or in shock, experienced rescuers advise you to leave them where they are until (1) an ambulance comes, or (2) you can find trained first-aid workers to move them.

Two doctors told us: "We often see people die whom we could have saved if they had not been moved by volunteers who had no first-aid training. Even a victim with a broken backbone can usually be saved if allowed to be unmoved. But well-meaning people often lift them out of wrecks, stuff them into the back seats of cars, and rush them to us. In doing this, they twist the spine, and the broken sections are hopelessly displaced. Jagged bones also penetrate the body.

'It is bad enough to lift or roll a badly

## What Are Your Responsibilities?

Do you have to stop at an accident scene and offer help? Legally, you do not. You may keep right on going. But if you don't stop, remember this: Some day other motorists may go on past when you need help.

Are you liable to be sued by someone you try to help? Lawyers for the American Automobile Association and the Automotive Safety Foundation say this:

68 POPULAR SCIENCE DECEMBER 1959

Anyone who offers help becomes in the eyes of the law a "voluntary rescuer." As such, you may be sued if (1) you commit gross negligence, such as propping up a car and letting it fall back on the injured; or (2) you run off and fail to finish the job.

"But the courts look kindly on any man who seriously tries to help his neighbor," the lawyers said. "There is small chance of your being successfully sued; and no self-respecting motorist will fail to stop for that reason."

### out . . . That's a mistake

injured person if you know how. It is dangerous in the extreme to let untrained rescuers carry them and let their bodies jackknife."

What to do about lifting cars: "Thousands of people get hurt all over again because motorists try to lift cars, find they can't, and have to let the cars fall back," and one police veteran. "Don't make the mistake of trying to lift a car bodily until you have eight or 10 strong men. There are times when four men can lift one side of a light car—but if you try this be sure you aren't pushing the other side down on someone."

If people are pinned. Often accident victims appear to be trapped when they are merely held by a foot twisted under a seat, rescue squads say. Crawl in and release the foot. If they are unhurt they can get out.

The squads often find people trapped on the floor under the dashboard. They can't get out because they can't lower their heads enough to clear the lower edge of the dash. "If they aren't injured, we merely push their heads down gently until they can pull clear," the squads say.

Now and then it is necessary to straighten out the car body before someone can be freed. It is far better to bend the wreckage than to cut it. Some excited rescuers bring acetylene torches. "We fight this tooth and nail because of fire danger," one squad reported. "We get a tow truck to hook its chain to the



wreckage and bend it an inch at a time."

If you find a driver trapped between his seat and the steering wheel, pressure on him often can be eased by the mere expedient of releasing the catch and sliding the seat back.

How to "protect the scene." Two cars collided on a heavily traveled turn-



pike recently. Three people were slightly hurt. But moments later five were dead Reason: Rescuers ran first to help the injured. Instead, police said, they should have run to flag down high-speed traffic that was approaching.

Often it is far more important to "protect the scene," police say, than to go at once to the injured. Flag down the first cars, have them pull off the road, and ask one or two responsible-looking drivers to go back with flares and flags, and slow down traffic.

If a two-lane road is blocked, send your flagmen both ways to warn traffic. Don't send them 50 or a 100 feet, as most motorists do. Send them out 500, 600, or even 1,000 feet.

People lying in the road? If you leave them there they may be run over. But moving them may aggravate their injuries.

Which should you do?

Police say it is better to leave seriously injured people where they are but take extraordinary steps to guard them. Police often place their cars squarely across the road, with 360-degree flashers going to warn traffic. If, in dire emergency, you decide to do this, place your car at least 50 feet away because if it gets hit by traffic it may be pushed against the victims. Also, police say, turn your car to face traffic and blink your headlights rapidly at approaching vehicles.

But what about fire? A frantic fear of fire often causes volunteers to haul out accident victims who should not have been moved. But how can you know what to do?

Rescuers say you can relax a bit if fire hasn't started in the car when you get

[Continued on page 244]

## INDOOR-BUILT PLANE GOES OUT WINDOW

John Taylor's kitchen in London became his dining room for 18 months. His dining room was turned over to aircraft production.

Taylor not only built the handsome monoplane at far right but designed it as well. He did all the work himself, calling on friends only to help lower it in pieces from his second-story apartment. Final assembly was done outside.



One of the wings is completed in the second-story apartment.



GOING UP. The helicopter at left hoists a section of prefabricated steel roof onto a refuge being built 10,000 feet up in the French Alps near Chamonix.

This is one of a number of windproof shelters under construction for the protection of mountain climbers.



HAPPY FAMILY. An orphaned puppy, kitten, mink, and ferret dine here with help from an artificial mother. The feeder, at an animal nursery in Brooklyn, N. Y., is a row of bottles with nipples stuck in a board covered with rabbit fur.



MISSILE TRAILER. The 70-foot carrier above was built to haul the new Minuteman intercontinental ballistic missile. The big trailer will be equipped with rails to cradle the missile being assembled by Boeing at Seattle, Wash.

THE POPULAR SCIENCE DECEMBER 1959

#### PS PICTURE NEWS



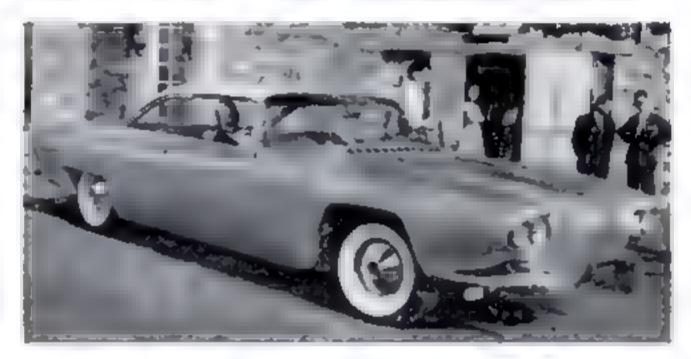
Fuselage on ladder.



In for a smooth landing after its first-and successful-Right.

#### CHROMELESS.

Your next Cadıllac might look like this if it were designed by Raymond Loewy. He re-did this Cadillac—with no brightwork—for the Paris Show. He took some other liberties as well with GM's top line—left off the tail fins and made changes in hood contour.





CLEAN SWEEP. The vacuum cleaner above keeps the tracks neat in the Long Island Rail Road's stations in New York. The pull in its 10-inch-diameter hose is so powerful that it can pick up grease dropped from standing engines.



"COMPACT" TIRE. Here's how the new 13-inch tire—for Detroit's compact cars—compares with a normal 14-incher. B. F. Goodrich Co. says it is completely new, far advanced over Europe's tires for small cars.

## Why the 1960 TV

Small changes, added year after year, have now brought TV to a new level of performance

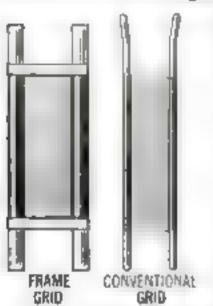
If YOU walk into a TV store in the coming months, the dealer will assure you that the new sets work better than ever. That'll be an aside as he steers you away from the good, but low-profit, table models and over to a Grand Rapids original that looks like wood, is wood, and bears a sticker guaranteeing it to be genuine wood sawed from trees.

The dealer, curiously enough, is right about the electronics. If you've been happily content with a set built in 1952 or '53, take a look at the 1960 models.

The picture is markedly crisper and more detailed, rarely marred by interference. The sound is lifelike. Usually you get excellent performance on nothing but a whip antenna sticking up from the back.

This improvement comes from no sudden breakthrough, but is the result of steady refinements that have piled up over the past five or six years. Here's what made the difference:

Tubes. Television started out with vacuum tubes borrowed from radio. The new ones are designed for television from



the cathode out, and it shows in the picture. New this year is the "frame grid," a sturdier support for the control grid wires (see drawing at left). The grid can have more and tighter turns of finer wire, placed closer to the cathode. This increases sensitivity

while reducing noise, so that you get a good picture from distant stations.

Automatic gain control. All sets have AGC to keep the picture uniform despite fluctuations in the signal. This year more use the best kind: keyed AGC.



PROGRAMED PROGRAMS: RCA's deluxe console automatically goes on or off and changes channels, following preset schedule. Any housewife with a Ph.D. degree can work it.



CLOCK TV: Popularity of early-morning TV college courses may have influenced sets that turn themselves on and off like clock radio.

which acts quicker, and isn't fooled so readily by interfering noise.

Tuners. One reason so many people get along on indoor antennas these days is the better sensitivity of the newer tuners. The old pentode has given way

12 POPULAR SCIENCE DECEMBER 1959

## Sets Work Better



IT'S A TV . . . IT'S A TABLE: For people who don't like to admit they watch TV, there is a disappearing model. The set tilts back, then the top folds over to conceal it in a table.



REMOTE TV: Across-the-room controls show up on more models than ever, even table sets. Many, like Zenith's, use "silent sound."

to the tetrodes, neutrodes, and cascodes. Picture power. There's a power race in television as manufacturers jack up the voltage supplied the picture tubes (many use more than 18,000 volts, several 20,000). This is good: higher voltage,

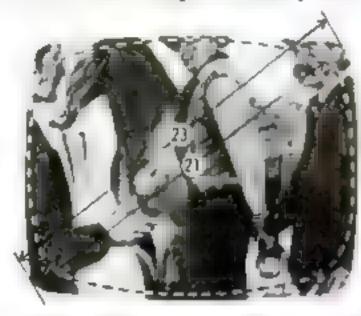


POLE TV: You can hang this GE set on a pole used for lights or room divider. Similar support bracket mounts receiver on the wall.

brighter picture. But watch out. The advertised figure—high voltage at no beam current—doesn't mean as much as high voltage at normal beam current. The PS chart specifies both.

Picture tube. The engineers have bor-

rowed ideas from radar to design exceedingly delicate picture-tube guns. They generate finer electron beams that paint in picture details formerly lost. The hullabaloo in 1960, though, will center around the 23-inch tube. Its glass safety shield, ordinarily separate, is glued onto the surface of the tube itself. The corners have been squared up to increase the diagonal measurement from 21 inches to 23 inches. The picture isn't so much larger; you just see bits of corner areas that a 21-incher clips off. Still, there are



real advantages to the glued-on safety shield: Internal reflections are eliminated, and the only place dust can accumulate to obscure the picture is on the front, where it's easy to wipe away.

Transformer power supplies. They're back on more and more sets. They cost money and are heavier, but do make chassis somewhat safer and easier to service—if one tube dies, the others stay lit. But it's not true, as a widely circulated trade magazine misinformed dealers, that a transformer power supply improves fringe-area reception. Other things being equal, it wouldn't make any difference.

Noise killers. These tricky little circuits, which make interference turn around and cancel itself out, are common now. Their success may explain a noticeable decrease in interference filters.

Printed circuits. Servicemen aren't screaming so much about the replacement of ordinary wires by strips plated on plastic panels. The boards have been greatly improved in recent years, and many are now marked with complete circuit diagrams to ease trouble-shooting.

Convenience. Remote controls are increasingly popular. Even without such extra-cost gadgets, tuning is easier. Controls have returned to the front, so you can see what you're switching to. On

	MANUFACTURER	CHASSIB	PICTURE SIZE	APPROXIMATE P	CABINET SIZE (AC. X W. X G. to mearest leads)	WEIGHT (Ib.)	1
	ADMIRAL	15D1 <b>8</b> 2056 2066	17" 21" 23"	\$160 \$190 \$230	16x19x12 21x24x18 19x26x14	38 90 100	
	DUMONT	RA 600	21"	\$230	20x25x18	100	
	EMERSON	120451 120496 120498	17" 17" 21"	\$128 \$178 \$248	13x16x17 14x18x12 33x26x13	37 44 75	
	GENERAL ELECTRIC	M-5** 3-4	17" 21"	\$170 \$230	15x21x12 20x27x16	40 63	
	HOFFMAN	Mark 10S* Super Mark 10	17° 23°	\$180 \$330°	14x22x 8 31x34x.6	44 92	
	MACHAVOX	MV1273 MV121LX55 IMV123L5 2MV147L5	21° 21° 21° 21°	\$215 \$189 \$260 \$335	15×24×12 32×23×20 30×28×17 30×40×17	n.s n s n s	
i	MONTGOMERY WARD	5081 5082 18601	21.	\$200 \$240 \$280	33128112 34129114 35129111	82 93 110	
	MOTOROLA	75-430 75-556 75-558 75-561 75-564	17" : 21" 21" 21" 21"	\$150 \$190 0.5.7 \$210 \$230	14x17x16 19x22x16 35x33x18 19x28x17 19x28x17	43 76 149 99 96	
	OLYMPIC	JA JA	17" 21" 21"	#.s. \$2.0 \$250	17x19x10 19x27x18 19x26x18	36 82 85	
	PACKARO-BELL	VB-3* 88* 98:07*	17° 17° 21°	\$170 \$200 \$360	15#18#13   24#15# 6   30#36#15	45 55 110	
	PHILOD	10H25 10C31 10C41 10C60*	17" 21" 21" 21"	\$170 \$189 \$249 \$370	16×19×12 19×25×18 19×29×13 34×29×.4	33 75 82 83	
	RCA	KCS126 KCS1277 KCS129	17" 21" 21"	N. S., N. E., N. S.	17x21x12 20x28x15 20x28x21	43 80 81	
	SEARS, ROEBUCK	57FM9144 57FM104 57FM114 57FM164	17" 17" 21" 21"	\$115° \$165° \$183° \$278°	15x17x17 15x17x11 22x24x16 34x26x14r	40 28 70 79	
	SETCHELL- CANLSON	C 106 260 2159	17" 21" 21"	\$189 \$219 \$299-	13×17× 9 19×29×16 32×27×16	32 : 70 81	
	SYLVANIA	537 544	17"	\$170 \$220	14x16x25 21x25x13	34 78	
	WESTING- MOUSE	¥ 2384 ¥ 2377 ¥ 2378	17" 21" 21"	\$190 \$200 \$240	16:20x12 21:24:19 19:30x16	42 81 90	
	ZENIFH	16025 16021* 17020*	17° 21° 21°	\$190 \$190 \$250	15=21=11 20=27=16 21=23=18	51 R 2 R 3	
		IDTES: n.s., No	T SDec	thed by	the manufac	2001001s	

MOTES: n.s., Not specified by the manufacturer; \*Same chassis evailable with 21" or 24" p cture \*Cascode luner on some models; \*Catalogue

many of the better sets, you can change channels without fiddling with fine tuning. Some have automatic-frequencycontrol circuits; others have set-it-onceand-forget-it adjustments. New tubes, which hold frequency better, help.

The chart accompanying this article lists important facts on 51 receivers

 PICTURE-TUBE DEFLECTION AND (degrees)	HIGH VOLTAGE (KV—ne beam cur	NIGH VOLTAGE: ()	AUTOMATIC FINE	LOCATION OF TUNING CONTROL	NUMBER OF IF	(F BANDWIDTH (MEESFYCIPS)	NUMBER OF TUN	AGG TYPE	INTERFERENCE	TUNER	TRANSFORMER POWER SUPPLY	POWER-SURGE LIMITING RESIST	PRINTED CIRCUITS USED	NUMBER OF TUBE FUNCTIONS	DFF-ON SWITCH WITHOUT CHANG VOLUME CONTRO
110 90 110	15 5 20 0 20 0	14.5 19.0 19.0	none none none	top top	3	3.1 3.8 3.8	6 8 9	keyed keyed keyed	1 IF trap 1 IF trap 1 high pass	tetrode tetrode cascode	HO YES Yes	no no no	yes yes yes	16 17 18	no no no
 90	18 0	16.5	yes	front	3	3.5	9	ampl derived	1 IF trap	neutrode	yes	DB	710	21	yes
90 110 110	13.5 16.5 16.5	12 0 15 5 15.5	none none	side front front	3 3	3.0 3.2 3.2	7 7	simple derived ampl derived ampl, derived	1 IF trap 1 2 IF traps, 1 FM filter	pentode neutrode neutrode	yes yes	yes no no	yes yes yes	18 18 18	no yes yes
 110 110	6.1. 6.1.	16.5 16.5	none none	front front	3	33	6 7	simple derived keyed	none	tetrode cascode	yes	na '	yes yes	19 22	yes
 110	17 2 19 2	16 0 18.0	none	front front	3	32	7	keyed keyed	R S R S	tetrode tetrode	yes yes	90% 90%	no no	21 22	yes yes
110 90 90 110	27.0 17.5 17.5 18.0	16.0 16.5 16.5 17.0	none none none yes	front top iront front	3 333	35 35 35 35	9 9 9 9	simple derived simple derived keyed keyed	3 IF traps, t 2 high pass 2 IF traps, 2 high pass	neutrode neutrode neutrode neutrode	yes yes yes	70 00 00	na na na	18 17 20 21	no no no no
96 116	16 0 16 0 17.0	14 5 24 5 15 5	none preset preset	front front front	223	3.4 3.4 3.4	5 5 7	simple derived simple derived keyed	1 IF trap 1 IF trap 1 IF trap	newtrode Neutrade Neutrade	No no yes	00 00	00 00	16 16 21	no no yes
90 90 110 90 90	17.0 21.5 21.5 21.5 21.5 21.5	16 0 20 0 20 0 20 0 20 0	none none preset none preset	front front front front front	33333	35 3.5 3.5 3.5	7 8 8 8 8	keyed keyed keyed keyed keyed	1 IF trap, 1 FM filter	cascode cascode cascode cascode	no no yes yes	yes yes yes yes	70 00 00 00	19 18 21 19 20	no no yes yes yes
110 90 90	18.0 18.0 19.5	17.5 17.5 19.0	none none	top front tront	2 3	30 30 35	4 7	simple derived ( simple derived ( ampl derived	1 IF trap 11 IF trap 11 high pass	tetrode tetrode cascode	985 985 985	00 00 00	no no no	18 16 20	no no yes
90 110 110	15.0 17.5 18.5	14.0 16.5 17.5	none none	side front remote	3 4	3.3 3.3 3.5	4 4 8	simple derived simple derived   keyed	1 FM filter   2 IF trap   1 high pass	neutrode neutrode	no yes yes	74% 110 110	NO NO NO	15 17 22	no na no
110 90 110 110	18 2 17 0 18.0 20 0	15.5 16.2 17.2 19.2	none none none	top top top top	3223	33 33 33 33		ampl. derived ampl. derived ampl. derived ampl. derived	1 IF trap 1 IF trap 1 IF trap 1 IF trap	tetrode cescode cascode cascode	no yes yes yes	yes no no	hes hes hes hes	19 19 19 22	746 00 786
110 110 90	15.0 18.0 20.0	14 0 17 0 19 0	none yes yes	front front side	3	33 33 3.3	6	heyed keyed heyed	2 IF traps 2 IF traps 3 IF traps	tetrade tetrade cascade	yes yes	yes yes yes	yes yes	21 21 25	yes yes yes
90 110 90 110	14 5 16 5 16.5 18 5	13 0 14 0 14 0 17 0	none none preset preset	side side front frant	3 3 3	3.0 3.2 3.2	6 7 7	simple derived heyed simple derived heyed	none none none	tetrode tetrode tetrode tetrode	NO NO NO	yes no yes yes	yes yes yes	17 19 18 20	no no yes yes
110 90 90	15 0 15 7 16.7	14.5 15.0 16.0	none none none	top tront tront	3	3.7 3.7 3.8	# # 11	keyed keyed heyed	none none	cascode cascode	yes yes yes	yes yes	10 10 10	22 22 27	no yes yes
110 110	17.0 17.0	16 D 16 D	none preset	top top	3	3.3	8	keyed keyed	1 iF frap 1 iF frap	tetrode tetrodes	10 10	yes yes	yes yes	18 19	705 705
110 90 110	15 8 16 0 18 0	14 6 15 0 17 0	preset none preset	front front front	3	3.5 3.5 3.5	9	ampl. derived ampl. derived keyed	1 high pass 1 high pass 1 high pass	tetrode! tetrode! tetrode!	no no yes	yes yes no	yes yes	19 19 21	yes yes yes
110 90 80	15 5 20.0 20.0	14.5 18.5 18.5	none none	front front front	2000	36 36 36	10 10	knyed keyed knyed	3 IF traps 3 IF traps 4 IF traps	neutrode cescode	yes yes	00 00 00	60 60 60	19 19 20	yes yes

Same chassis available with 21" picture tube: "Same chassis available with 24" picture tube; "Console, tube, "Same chassis available with 23" or 24" picture tube; price; shipping extra, "Neutrode tuner on some models.

made by 17 manufacturers. The listing is by chassis, since many different models, covering a wide range of prices, may be built around essentially the same works. Models are all, except where noted, of the table-top kind.

Your best buy is generally the bettergrade chassis in the simplest table-top cabinet. Many people think these are also the best looking. But for other tastes the cabinetry ranges all the way from brassy modern through something called Pan Asian to what looks like a cathode-ray tube grafted onto grand-ma's rocking chair.—Martin Mann and Hubert Luckett.



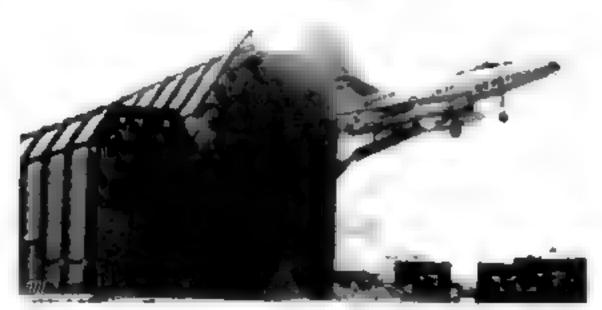
### Now Even Mercedes Has Tail Fins

DETAIL changes show up on most Mercedes-Benz cars for 1960. But Mercedes people worked hardest on the new 220 series, a trio of six-cylinder sedans. Wraparound windows, a broader and lower grille, even a hint of tail fins, have altered the classic Mercedes profile. All three share lower, wider, longer bodies.

By modifying the single-overhead-camshaft engines slightly, they've teased more power out of them. The 220 model now turns up 105 hp. instead of 100. Switching from one two-barrel carburetor to a pair of single-barrel downdraft carburetors provided the increase. On the 220S, up four horsepower to 124 hp., a pair of two-stage, twin-barrel carbs makes the difference. Straightening the induction pipes on the fuel-injected 220SE raised its output to 134 hp.

Suspension has been altered front and rear to improve handling. The roll center, previously 1½", is now 5½" above ground level—reducing body sway in fast turns. Front-end control is improved by extra-long shock absorbers anchored outboard next to the wheels, by an anti-roll torsion bar, and by two leaf-spring connections between the unitized body and the suspension unit.

Borrowing from their race-proved 300-SL model, Mercedes has added a horizontal auxiliary spring to the 220 rear suspension. The spring resists flexing by the split rear axle, discouraging wheel hop when the independently spring



76 POPULAR SCIENCE DECEMBER 1959

#### INSIDE TAKEOFF.

This F-100 Super Sabre zoomed into the air from inside a shelter designed to withstand an atomic blast. The zero-length launch, accomplished with rocket assist on the fighter plane, took place at Holloman Air Force Base in New Mexico. The flight was made for the Air Research and Development Command.



TNOSE "RIDGES" (Sins) on rear fenders are backing and parking aids, explains Mercedes-Benz. Other changes to the stern include a sturdier bumper, combined tailand stoplights, 50 percent larger trunk, wraparound rear window

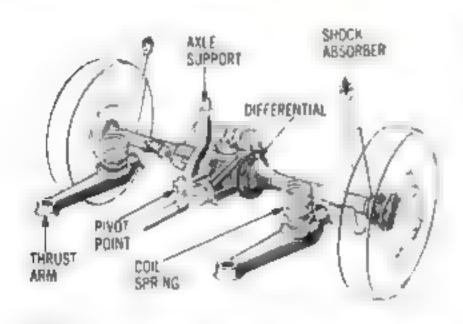
PADDING covers the steering-wheel hub, edges of the dash, sun visors, window ledges, and door pillars. The two separate, contoured front seats have a storage tray between. Set vertically, speedometer changes hue at 30 m.p.h.



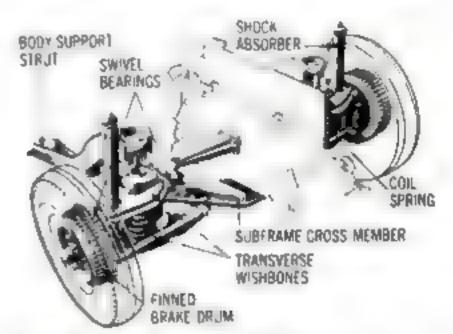
rear wheels hit a bump or depression.

Brakes have been beefed up to handle the 95-105-m.p.h. top speeds possible in 220 models. The two brake shoes on each front wheel are both leading shoes. This arrangement, requiring a separate cylin-

der for each shoe, doubles the selfenergizing effect. Brake drums have ribbed aluminum cast around iron for better heat dissipation. On the 220S and 220SE a vacuum servo power-assists the brakes, reducing pedal pressure.



SWINO AXLE AT THE REAR now carries a compensating spring above the pivot point, as on 300SL racing car. This, and relocating the shock absorbers farther outboard, improves the ride.



FRONT-WHEEL SUSPENSION and engine are both mounted on a single cross-member connected to the body. Each wheel is independently aprung by unequal-length wishbones and a coil apring.

#### CARPORT-GARAGE.

A prefabbed structure made in England shelters a trailer and also houses the family car. The carport section overhangs an area 11 feet wide and 25 feet long. In the garage section is a nine-by-18½-foot space for the car. Behind the garage is a small storeroom, entered through a sliding door that connects it with the carport.





HEAVY TRAFFIC in turn at track in Patterson, N.Y., one of many specially built go-kart race-

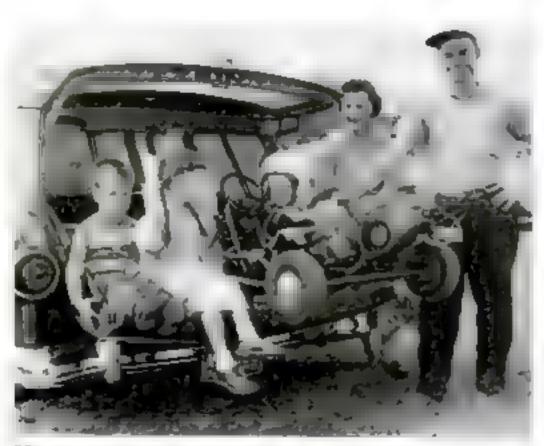
ways springing up across the country. Circuit gives handling thrills of a real road race.

# Go-Karts Make Auto Racing a Family Sport

Potent little one-lungers are spreading the fun of race-track competition all over the U.S.

By Hubert Luckett

TRGED on by high-revving twostroke engines, a new gasolinepowered hobby is rolling across the country. Leaves are going unraked, Sunday dishes are being left in the sink, and homework is being polished off



78 POPULAR SCIENCE DECEMBER 1959



WHOLE FAMILY joins in the fun, but the prerace tune-up is usually up to dad. Karts fit easily into a station wagon or atop the family sedan.



JUNIOR OFTEN RACES the same car mom and dad use in powder-puff derby or men's race.

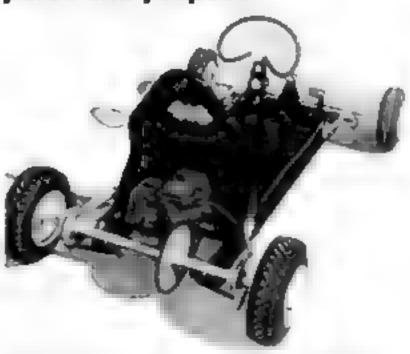
with unbelievable briskness as dad, mom, and the kids scurry off to join in the fun.

Karting is what they call it. A go-kart is what you do it with. Almost any patch of pavement will serve for the scene of activities. The action packs enough thrills for the most seasoned race driver, and yet the high points of any session are apt to be the powder-puff race and the run for juniors only. Roaring along with the seat of your pants a scant two or three inches off the road, your feeling of speed is enormously magnified. The course is short and the turns come up often. You can cram more real car-handling fun into an afternoon on a parking lot than you

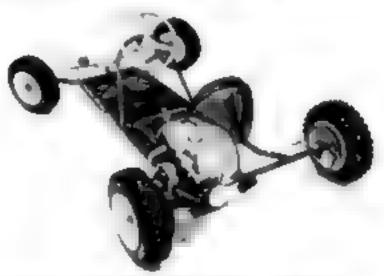


HELMETS ARE A MUST even if a new hair-do gets mussed. The ladies have taken to karting as to no other auto sport. Usually they race only in their own events, Competition is fierce.

## There's a kart to fit every purse and purpose



Kurtis Kart has torsion bern and shocks.



Go Kart was the first on the market.



Norseman Thunderbolt by Rocco Products.



OVER A HUNDRED MANUFACTURERS are selling karts. Prices range from just over \$100 to nearly \$500. Dual engines such as the one in the bottom photo are popular for high-performance, all-out race cars. This one is a Caper Cart by Ben Hunt and Son.

can get in a whole day at a road race.

Go karts are direct descendants of the familiar kıd's sidewalk car, but don't let the family resemblance fool you. In personality, they are more closely akin to a sports car. A skilled adult on one of the more powerful of the breed can do 60 m p.h. on a smooth track. But most karting is done with less potent machines where speeds of 20 to 35 miles per hour can win races

Busic specifications. Not any vehicle with four wheels and a one-lung engine qualifies as a go-kart. Most manufacturers build karts that meet the specifications

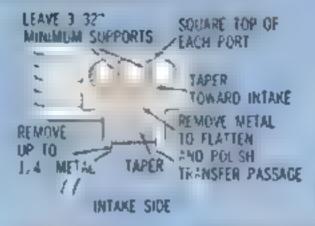
set up by the Go-Kart Club of America:

Cars must have all-metal frames with no body shell above the wheel center. Maximum wheelbase is 50 inches, minimum 40, overall length not over 72 inches. Tread width must be at least twothirds the wheel base. Tires are tube-type pneumatics. Maximum diameter is 12.8 inches, minimum nine inches. No transmission is permitted that will allow drive ratio to be changed while the car is in motion. Only two-cycle engines are allowed, with cars divided into three classes according to engine displacement.

These basic requirements are really

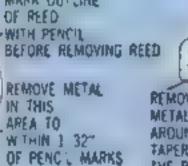






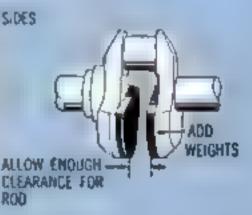




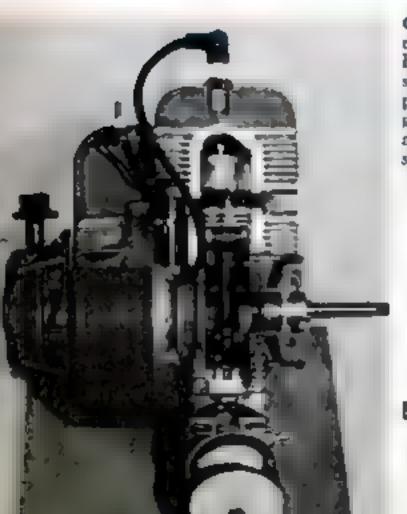


REVERSE SIDE 0 REMOVE METAL ALL REMOVE METAL AROUND AND EACH S DE BUT LEAVE ENDUGH TAPER TOWARD THE REED SUPPORT FOR REED





SIMPLE MODIFICATIONS give more power from a two-cycle engine. Remove metal with a hand file where indicated. A manual prepared by Clinton Engines Corporation gives complete directions. Clinton also sells high-speed kits for some engines, to give even more power.

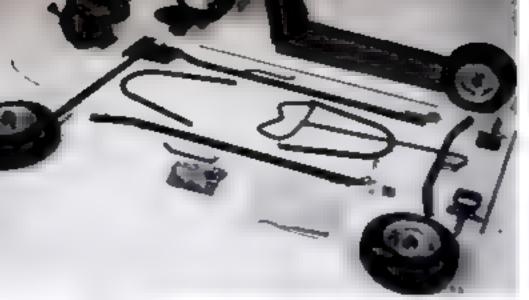


CUTAWAY of one of the engines made by West Bend Aluminum Co. shows the extreme simplicity of a two-evele engme. Only moving parts are piston, rod, crankshaft, and flywheel.

> ANTIFRICTION REAGINGS. are used throughout the more expensive engines. Lower-priced engines can be improved by substituting needle-bearing con rods for the bushing type ordinarily used.

D POPULAR SCIENCE DECEMBER

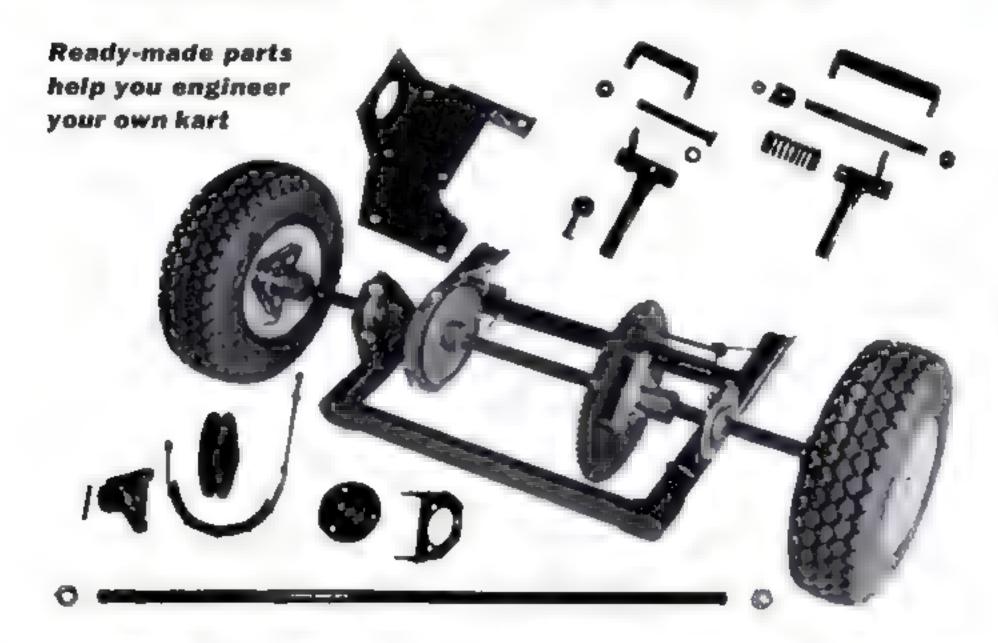


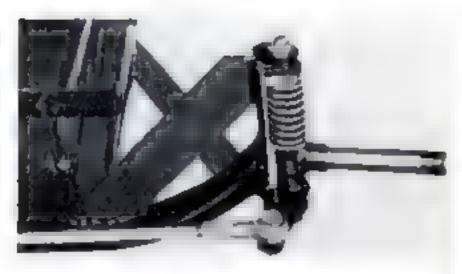


KITS ARE THE MOST POPULAR WAY to buy a kart. You can get them with the welding already done for you, or simply with the tubing cut to size, ready to be fitted and welded.

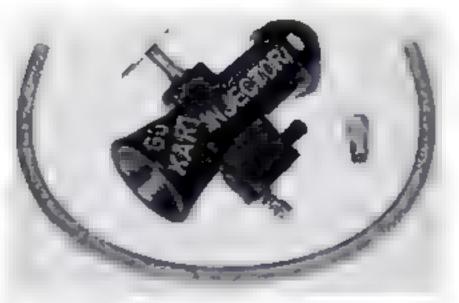


FINISHED KART assembled from the kit at left looks like a professional job. This is the Lil 500 made by The 500 Industries, Inc. You save about \$30 by assembling it yourself.





INDIVIDUAL PARTS are available from most kart manufacturers. Those shown in the center and the independent front-wheel suspension pictured here are from Hovey Machine Products.



FUEL INJECTOR is an accessory sold by Go Kart Co. to increase engine output. It works with either a pressurized fuel tank or by gravity feed if the tank is located above it.

Big makers are teaming up to produce them in quantity for adults

INDY RACE-CARBUILDER, Frank Kurtis, designed this car for the Percival Co. The first major manufacturer from another field to jump on the go-kart bandwagon, Percival plans to make at least 10,000 in 1960. Aim is at an adult market.





ENGINE MOUNTED LOW and forward of the rear axle improves weight distribution for better handling. Caliper-type racing brakes apply equal pressure to opposite sides of the sprocket.

the key to the go-kart success story. Before they were drawn up in early 1958, one-lung cars could scarcely be classed as a full-fledged adult hobby. There were quarter midget racers for the Little League crowd, but you needed a five- or six-hundred-dollar machine—and sadder yet, dad sat on the sidelines. True, other less-fancy cars for kids are on the market and doing a brisk business. But even they are expensive when thought of as strictly a child's toy. Homemade cars an adult could ride were apt to be made to fit whatever materials the back-yard mechanic could acrounge. Even when they were well made, there was too much difference in them to offer a basis for competition. After you had proved it would run, there was no very exciting activity to sustain interest.

Rond to bigger business. With the machines standardized on a design the whole family could use, and racing them a popular part of the fun, the hobby and an industry to support it exploded all over the map. One market survey shows



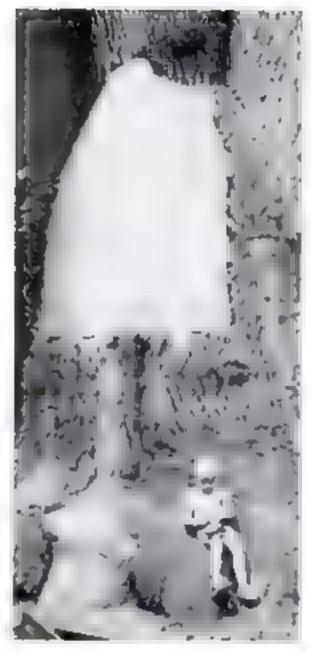
FRONT AXLE IS BENT to allow the foot pedals to be placed shead of the steering linkage. This lets the driver sit forward of usual location for better balance, and also protects the linkage.

that industry sales will hit between four and five million dollars this year, soar to 15 million in 1960, and will be pushing 50 million by the end of 1961

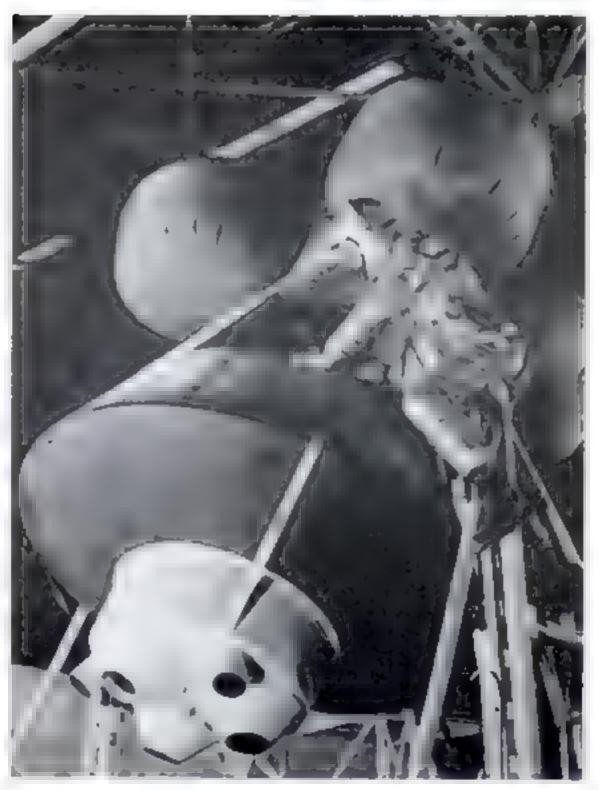
In spite of the impressive number of factory-produced karts that have been sold, it is estimated that nearly half the karts now in use are one-of-a-kind—either owner-built or made to order in a neighborhood welding shop. Even with the factory-made jobs, the majority have been sold as kits. There's no doubt that a big part of the kick in karting is driving a car you made yourself,

And this part of the fun is not over when the kart is finished. There are always improvements to be tried. Whether you're starting from scratch or modifying a store-bought machine, it's a lot easier, now, to indulge in home-grown engineering. Manufacturers, large and small, have responded to the demand with parts, supplies, and accessories designed specifically for go-karts. You can get steering gears, auto-type brakes, special racing

[Continued on page 246]



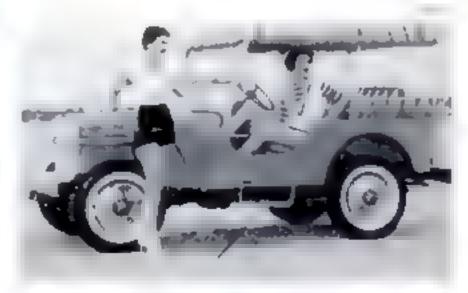
PLASTIC SURGERY. When a heavy limb fell from an 800-year-old oak in the Waldemarsudde Park in Stockholm, Sweden, tree surgeons covered the wound with chicken wire and hard-board. They plan to graft new bark over the giant patch, In time, the scar is expected to be erased.



CAPSULE AND CARGO. Here's a mockup of one of the manned satellites that McDonnell Aircraft is building for Project Mercury. At lower left are retrorockets to brake the landing; at top, flotation bags to give the satellite buoyancy and stability in water.



TRAVELING VILLAGE. Part of 45 prefabricated homes being shipped to Algeria are shown above on flatcars as they leave Paris. Each has four rooms. The housing is intended for Arab nomads that the French hope to settle permanently.



FRINGE ON TOP. This Jeep Surrey is built by Willys for rental to guests at resort hotels and vacation areas. It has a striped canvas top complete with fringe. The body is a standard Jeep design. It's driven by a 60-hp. engine.



The big tractor turns on a 171/2-foot radius. It has four-wheel drive, with front and rear wheels on separate units, but coupled together.

#### TRACTOR HANDLES BIG JOBS

This 10-ton tractor was designed to pull the biggest farm equipment ever built. The rubber-tired monster hauls plowing and planting machines weighing up to three tons. It works 19 acres in one hour.

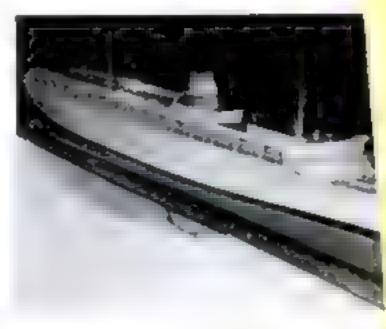
The new tractor is powered by a six-cylinder, two-cycle GM diesel that develops 218 hp. at 2,100 r.p.m. John Deere, Moline, Ill, will start producing the tractor and its big working tools next spring.



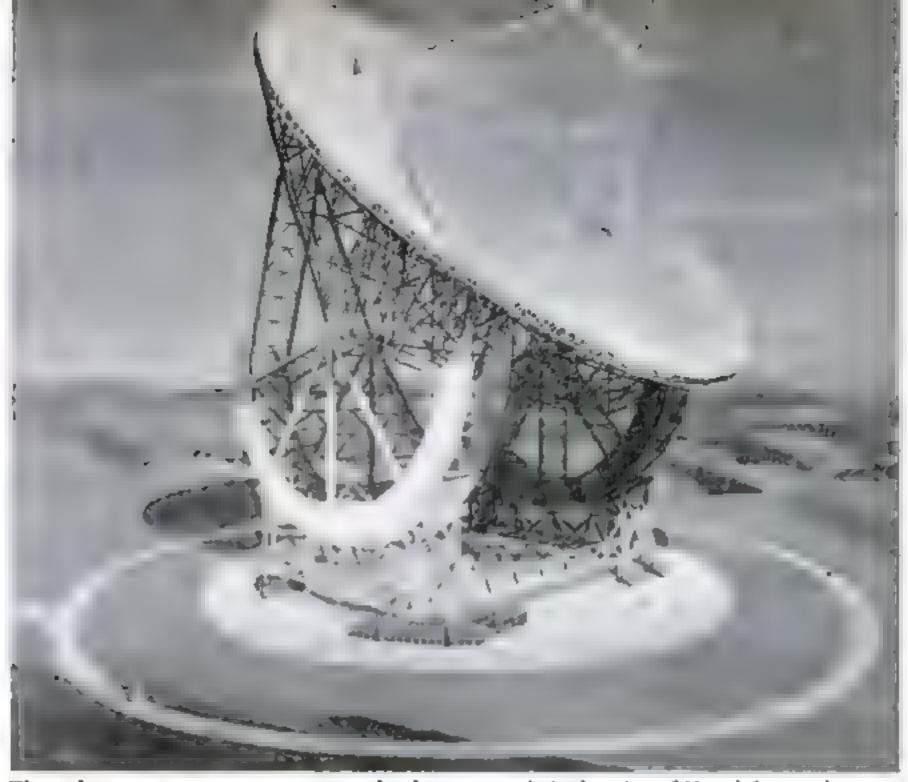
Above, it lifts the biggest pickup made—an integral plow with eight 16-inch bottoms.



QUIET CALL. A pocket-size radio receiver has done away with raucous loudspeaker calls for employees at Invalides Air Terminal in Paris, Like doctors' radio pagers in hospitals, it emits a discreet beep, It's then held to the ear.



NOW A FLOATEL. The ho a-ship shown in model above would 6,000 passengers to Europe for \$50 to \$125. Food, drinks, recreation would be extra. The proposed ship would be 1,152 feet long, cross the ocean in four days.



Those dots on concrete apron are people, shown to scale in drawing of Navy's huge telescope.

## New Radio Telescope Is Man's Biggest Machine

#### By Martin Mann

HE biggest machine that men have ever built is now taking shape atop a scraped-off knoll in the West Virginia hills. A giant dish of steel and aluminum, it will tower higher than the Washington Monument, be broad enough to swallow an entire stadium—playing fields, grandstands, and all.

Bigger structures have been erected, but this is a machine. It must hold machinelike tolerances. It will move. The stupendous dish will tilt nearly 180 degrees, horizon to horizon. The entire structure, dish and steel-lace supports

totaling 400,000,000 pounds, will rotate on freight-car-size rollers.

The dish is a radio antenna. It is designed to catch the faintest whisperings of signals from unimaginably distant space. It should reach, literally, beyond the end of the universe—if the universe has an end.

Part of the time this \$79,000,000 antenna will be a radio telescope, listening for the weird whistles and crackles from natural radio sources—cosmic clouds, stars, or whatever they are—in the sky. Twice the size of the biggest radio telescope now in use (England's Jodrell Bank), it will be able to discover many

new celestial broadcasters, pinpoint some that are already known vaguely, and settle some hot arguments among astronomers. (When did the world begin? Is creation still going on? Where does the universe end? Or does it extend forever?)

Secret projects. Part of the time the Navy will use its great antenna to research a space-wide communications network using the moon to bounce messages. But most of the time it will be busy on jobs that the Navy steadfastly refuses to describe. Some possibilities are easy to guess. For keeping tabs on Russian rocketry, this super-sensitive antenna should

be better than a blockhouse seat at the launching pad: It ought to pick up the static generated by the hot gases from the engines at blast-off. Conceivably. the Navy might have up its blue sleeves a new, ultra-delicate warning system to protect the United States against missile attack, or to unmask the silent apy satellites that everyone expects will be overhead soon (if they aren't in orbit already).

Everything about this job is the most—from choosing its location through designing and building it to making sure it will work (the West Virginia legislature had to pass a special law to help). The engineers immodestly compare their achievement to that marvel of the 19th century, the Brooklyn Bridge. The boast is justifiable.

The dish, made of aluminum mesh, will reflect radio waves, just as the glass mirror of an optical telescope reflects light waves.

The dish is only a reflector. The antenna proper, held at the focal point of the dish by a tripod of trusses, will catch the concentrated radio waves and feed them over special wires to extremely powerful amplifiers in buildings at the station. There they can be recorded as out-of-this-world sounds on tape or wiggly lines on paper, and delivered to the oracles for analysis.

Designers' dilemma. The outlandish size of the reflecting dish is what rattled the designers. It has to be big to give

it sensitivity, so that it can gather in the weakest signals from fantastic distances (estimated range: 38 billion light years, which comes to an utterly incomprehensible number of miles—200 million million billion).

Size also pays off in focusing of unprecedented sharpness. The Navy dish should be able to tell one celestial radio source from another when their directions differ by less than one minute of arc. It's as though you spotted your house from an airliner 10,000 feet up and could then recognize which of two boys wrestling in the back yard was your son and which the neighbor kid.

But size alone is not enough. The surface of the dish has to be precisely shaped to receive the very short waves that the scientists want. The wave length is about one inch (television waves, generally considered very short, run to many feet in wave length).

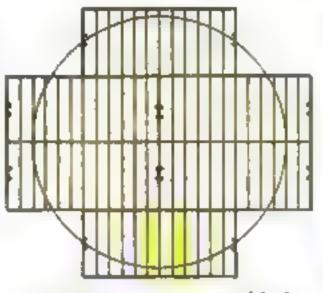
And worse. This Goliath, slowly moving 55 stories above the ground, must maintain its precision despite wind and sun. A big bridge can expand

and contract as it heats up during the day and cools off at night. The Empire State Building sways several inches in a stiff breeze.

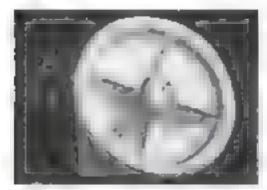
Not this thing. The wind may push at one edge, the sun may heat half its more than seven acres while clouds shade the rest. The shape will stay the same, accurate to a fraction of an inch. How? An intricate system of detectors and motors will constantly push and pull on sections of the dish to balance out stresses caused by wind and heat,

Who's who. One indication of the project's complexity is the number of organizations involved: The design is the work of Grad Urbahn and Seelye, a New York engineering combine. Three companies—Tidewater Construction Corp. of Norfolk, Peter Kiewit Sons of Omaha, and Patterson-Emerson-Comstock Inc. of Pittsburgh—have the prime contract for construction, which is being supervised by the Navy's Bureau of Yards and

[Continued on page 250]



SIX FOOTBALL FIELDS could almost fit in telescope's gigantic dish. It's 600 feet across—about seven acres.



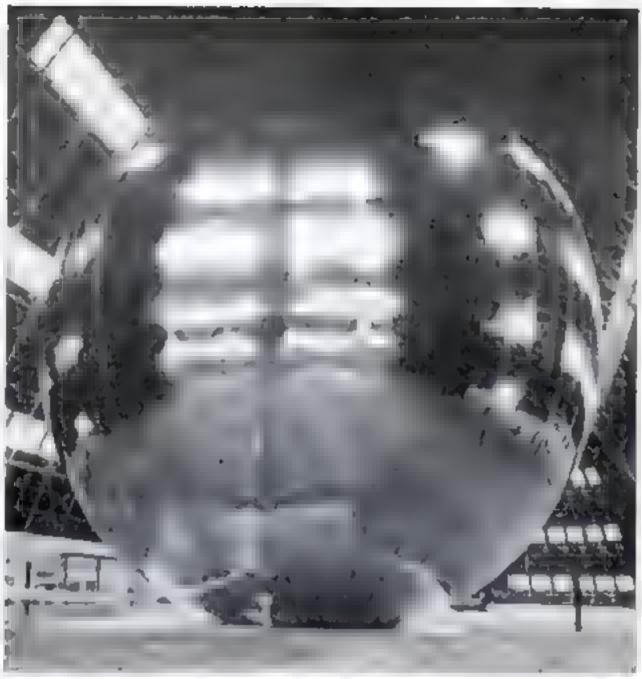
Solar-energy collector would power satellites.



Parabolic reflector for longrange radar.



Radar corner reflector to aid astronavigation.



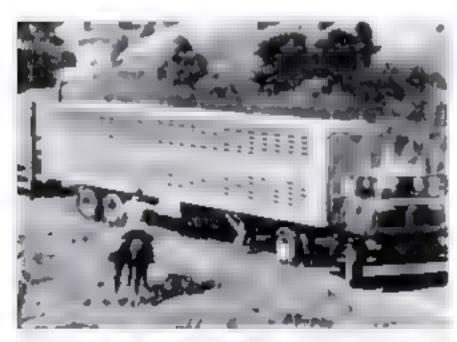
Huge 100-foot sphere undergoes test inflation with nitrogen gas.

#### BLOW-UP SATELLITES TO CIRCLE EARTH

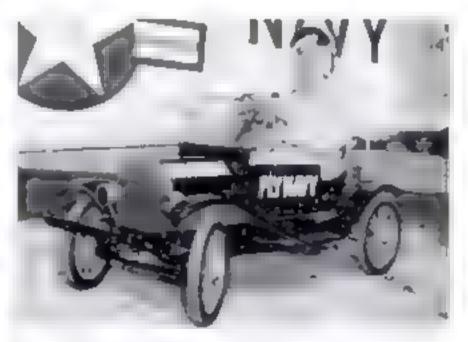
This 100-foot inflatable sphere, launched recently by the National Aeronautics and Space Admin., may be the forerunner of blow-up, earth-circling satellites. Others proposed: 30-inch and 12-foot spheres, a 30-foot solar-energy

collector, a parabolic radar reflector, a 12-foot radar corner reflector.

The giant aluminum-coated plastic bag was sent up 250 miles. Launched in a 30inch package, it was inflated in space, stayed aloft 30 minutes.



CATTLE CRUISER. Steers now go to market in style in trailers like this. Carriers measure 30½ to 40 feet in length, have vented side panels of steel with additional adjustable vents in front. The vehicle is made by Fruehauf Trailers.



BABY MODEL T. The half-scale Ford above is driven by a Grumman test pilot at the Bethpage, N. Y., plant. The little car was built for use by the Navy as a recruiting aid. It's garaged at Floyd Bennett Field in Brooklyn.



A new chemical process you use at home may mean no more warped, misshapen wood

By F. A. Strenge

A SIMPLE chemical bath for green wood that anyone can apply now stops shrinkage dead in its tracks. Just announced by the U. S. Forest Products Laboratory in Madison, Wis.,

this remarkable discovery also stops the warping, checking, and cracking that occur as wood dries. Although still under test, it promises to end the heartbreak of seeing painstakingly made carvings, bowls, and furniture turnings ruined by twists and splits.

If you have a back yard full of valuable trees, the new process means you could slice yourself a hunk any time you want and use it—as is—to make a fine piece of furniture. It means you could buy green



WHITE AND WAXY, new anti-shrink chemical (left) is simply melted like paraffin and brushed



on (right). Small objects are best wrapped in aluminum foil and stored during drying.

wood cheaply or treat improperly dried wood to be sure of safe results.

All this is made possible by a white, waxlike substance. It's a chemical cousin of the familiar permanent-type antifreeze used by millions of motorists. It is called polyethylene glycol-1000.

Ensy to use. You can melt the substance like wax and brush it on green wood, or dissolve it in water and soak the wood in it. Either way, the chemical penetrates the fiber walls of the wood and provides a "bulking" action that blocks shrinkage. A piece of wood treated with it remains the same size after drying as when green—and checks, splits, and warp can't occur.

The treatment is especially useful for things made of short, thick pieces of wood, such as partially turned furniture legs, rough-carved gunstocks, bowls, and art carvings. Rough turning or carving is recommended first because it opens up more pores in the green wood through which the chemical can penetrate. Since dry wood has already shrunk, little is gained by treating it.

Discoverer of the process is Dr. Alfred J. Stamm, internationally known for his many years of wood research. He regards the treatment as especially promising because of its simplicity and the chemical's low cost—about 35 cents a pound in small quantities and substantially less in large amounts.

Soaking in a water solution of the chemical is more practical for partially turned or rough-carved pieces. Polyethylene glycol dissolves faster in warm water than cold. A one-to-two solution is adequate—one quart of chemical, two of water.

Walnut gunstocks carved from green wood to within 1/4" of their finished size and soaked in the chemical were kilndried with no evidence of checking or other damage. A manufacturer of wood carvings found that his troubles with checking and splitting were virtually eliminated. He uses a 30-percent solution for treating his rough green carvings. After they have been dried, he finishes carving them, then sands and dips them in varnish.

Finishing problem. Finishes dry slowly on treated wood, so Dr. Stamm recommends allowing plenty of drying time. He found that a new polyurethane varnish gave an especially beautiful fast-drying



INTRICATE CARVINGS like these dogs and horses were shaped from completely green wood. There are no traces of warping or splitting.



GREEN-WALNUT GUNSTOCK is about to get antishrink bath from Dr. Alfred J. Stamm, originator of the process at U. S. Forest Products Lab.

finish. Varnish and other coatings prevent leaching of the chemical from the wood by water.

Polyethylene glycol is also a good decay preventive. Dr. Stamm believes it deprives decay fungi of the water they need.

Polyethylene glycol-1000 is not yet available in retail stores, but can be obtained from the Dow Chemical Co., 1000 Main St., Midland, Mich., which sells it under the name Polyglycol E-1000; or from Union Carbide Corp., 30 E. 42nd St., New York 17, N. Y., which sells it under the name Carbowax.

#### PS PICTURE NEWS



OVERSIZED MUSHROOM. The giant tower above holds water for use by the people in Toronto, Canada. Called an Aquatore, it's described as an atomic-age water tower—because of its resemblance, no doubt, to a mushroom atomic blast. The car at left indicates its size.



Ladder towers over a 15-story building . . .



... telescopes neatly for hauling by truck.

HIGH STRETCHER. This 206-foot fire ladder, world's longest, reaches to the top of a 20-story building. It takes men and hose up on a platform, has a radio for talking to the ground crew. Metz, of Karlsruhe, Germany, the maker, also built the previous highest—172 feet.



Lead ore is purified, as in this photomicrograph, when it clings to bubbles of air.

## Now Bubbles Are Big Business

A headache to the home owner and motorist, they perform feats of magic for industry

#### By Louis N. Sarbach

DOZEN years ago, bubbles were all the rage with the small fry. In a single week more than 50,000 jars of soap-glycerine solution were sold in Atlanta, Ga., alone. Like all fads (and bubbles), the bubble fad finally burst.



**SUBSLES** keep this Swedish waterway open to ferry traffic through the winter—compressed air acts as an autifreeze on the ice.

#### Bubbles purify ores, quench fires and absorb the

But scientists and engineers are getting more interested in bubbles all the time. They've put them to work—separating ores, fighting fires, keeping logging ponds ice-free for year-long operation, increasing the shelf life of beer, and doing useful jobs for industries ranging from power companies to pea-packers.

Bubbles are a problem, too. Glass manufacturers spend large sums keeping them out of window panes and crystal stemware. Dozens of industries battle against foam. And hydraulic engineers spend sleepless nights worrying about the sheer destructiveness of bubbles—billions of bubbles that boil in water mains, in dam spillways, in the wake of ship propellers. These are the bubbles of cavitation, which can savagely erode concrete and metal slike.

Laboratories throughout the world are currently engaged in bubble research. Aided by microscopes and high-speed motion pictures, researchers sit in at the birth of bubbles, study their growth, decline, and rupture, and publish technical reports bristling with equations.

A bubble is a globule of air or gas within a liquid. It is round because the enclosed gas seeks to expand in all directions, while surface tension seeks to shrink the liquid wall to the smallest area possible. But the true nature of

bubbles is provokingly elusive. No one has yet managed to slice a soap bubble and examine a cross-section of its film. No one knows for sure how bubbles form, whether in a boiling tea-kettle or a bottle of soda pop. The current theory is essentially this:

Most liquids are "weak"—easily "fractured" by heat or mechanical movement, as the churning of a marine propeller. Also, they usually contain gas—such as air—in solution. They also contain submicroscopic impurities, considered to be the sites of bubble formation.

When, for any reason, a low-pressure region develops in the liquid (due to heat or motion), gas comes out of solution, attaching to these minute impuritues—and you have bubbles.

Whatever bubbles are, their talents are many and various. Some years back, National Bureau of Standards scientists wanted to know how fast the flame of an explosion speeds through air. Using carbon monoxide gas, they formed a soap bubble around a gap between two metal wires, then made a spark jump across. A high-speed camera, shooting more than 1,600 frames per second, recorded the resulting explosion. Analysis of the film showed that exploding CO gas expands at around 20 m.p h.

Go into certain metallurgical labs and



coth sur swimmaste: A patented bubbler system keeps the water of this pond free of ice for the village swans at Laza, Sweden,



With FOAM—billions of bubbles of trapped air—firefighters lay down a blanket to smother the flames in this Air Force fighter.

#### shock of dynamite explosions

likely as not you'll find scientists staring through microscopes at soap suds, bubbles in batches. What has this to do with metals? Plenty.

The crystal structure of metals, it seems, is very similar to the structure of such bubble-aggregates. More important, the way masses of small bubbles merge into large ones is closely analogous to the growth of metallic grains. Soap suds, in short, have become a simple, effective and inexpensive laboratory model for the study of metals. These bubble model studies at General Electric, for example, are expected to lead to stronger metals with improved electrical properties.

The National Bureau of Standards is currently studying the behavior of stressed metals before fatigue failure. One scientist, Irene C. Minor, has found that if transparent pressure-sensitive tape is applied to a surface in which microscopic fatigue cracks have already appeared, additional stress produces tiny bubbles beneath the tape. Unlike the cracks, these bubbles are plainly visible to the naked eye. Such experiments suggest new methods of detecting imminent fatigue failure in certain metals, with the promise of safer aircraft and other metal structures.

One of the most imaginative bubble tricks is the "bubble curtain." This is produced by sending compressed air through lengths of perforated pipe under water. The device has been used at northern wildlife refuges to keep ponds ice-free for migrating waterfowl. Behind the idea is the fact that water reaches its greatest density at 39 degrees F, and sinks to the bottom. The rising bubbles keep carrying this warmer water back to the surface, which never quite freezes.

State conservation departments sometimes use bubble curtains to melt the ice on lakes during protracted cold spells, giving game fish access to oxygen. Northern lumber companies have started using them to keep their logging ponds open for winter-long operation.

Bubble curtains have gone to work recently protecting hydroelectric dams from pressing masses of ice, keeping turbine intakes open despite subzero surface temperatures, and maintaining open water in navigation channels.

Bubbles are busy in the everyday



THIS IS A LUMBER SLUICEWAY in midwinter, Far Northern style. Two thousand feet long, it is kept ice-free with a system consisting only of compressed air and a plastic hose.

world. The foam in your beer bottle did a job before you ever opened it—in fact, before it was closed in the brewery. If the bottle had been capped right after filling, air with its oxygen would have been capped in, too. Your beer soon would have become oxidized, giving it a fruity, "estery" taste.

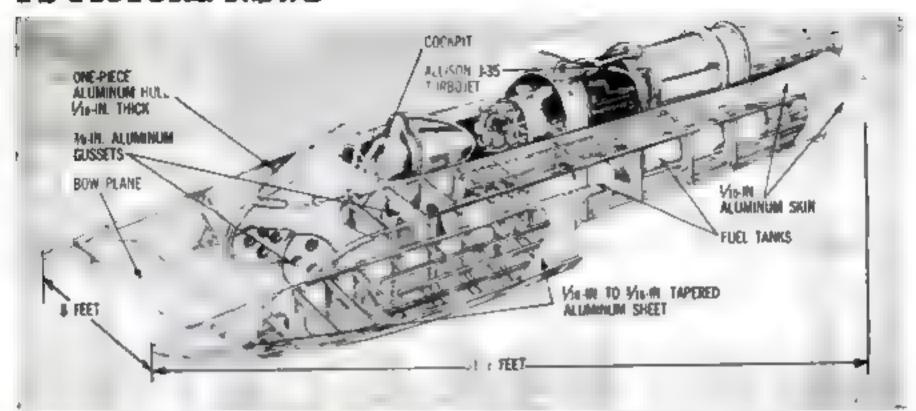
To prevent this, the brewer simply agitates the bottle, by striking it or applying ultra-high-frequency sound waves. Carbon dioxide bubbles foam to the top, driving off the air. On goes the cap, and your beer stays beery.

Bubbles can be trained to fetch and carry. What's more, they can be trained to "recognize" what they carry—valuables, for example, like gold, silver, copper, and other important metals. Here's what happens. Ore is crushed and mixed with water. Chemicals are added, and compressed air or gas is bubbled through the mixture. The bubbles get busy at once, each one picking up a payload of pure metal and floating it to where it can be collected.

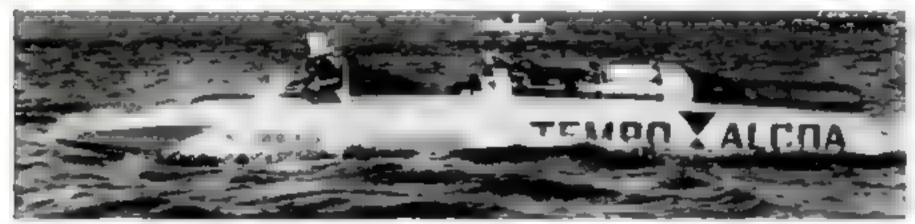
This is froth-flotation, the process now used to recover most minerals from their

[Continued on page 248]

#### PS PICTURE NEWS



More than half of Tempo Alcoa's 5,800 pounds is in jet engine, which develops 5,600-pound thrust.



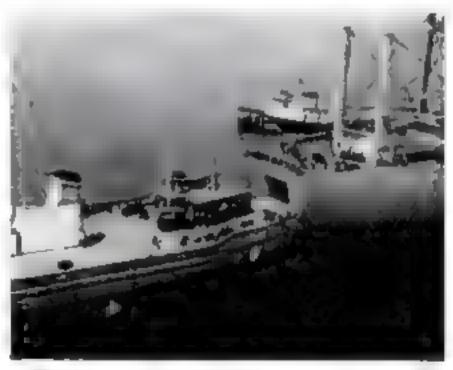
Trial runs on Lake Huron indicate jet hydroplane can top 300 m.p.h. World record is 260.35.

#### U.S. JET BOAT AIMS FOR WORLD SPEED RECORD

Piloted by Guy Lombardo, Tempo Alcoa will scoot across an inland lake this spring to attempt the water speed record. Designer-builder Les Staudacher sheathed her bottom and bow in one 35foot aluminum aheet to avoid joints. The aircraft jet lifts the hydroplane's main hull nine inches out of water, leaving three points in contact. The engine gulps its 165-gallon fuel supply in 10 minutes.



EARSPLITTING FLAME. The blast of this 5,000-degree flame is so loud that the operator wears ear muffs—and so bright he wears dark glasses. GE uses the flame in its missile plant to test materials for nose cones.



SEA TRANSFER. An Army truck rolls off a stern-to-stern ramp, above—from a Navy cargo ship to the deck of a beach discharge lighter. The operation, off Cape Charles, Va., was part of a test to speed beachhead-equipment landings.

Tooling the fastest
U. S. car ever built,
Mickey Thompson shifts
Into second at 210
m.p.h., Into high at
315. His present
record: 367 m.p.h. His
target: a mark that
no driver has ever
achieved—400



# The Hotrodder in the World

By Wesley S. Griswold

HE fastest driver in America wants more than anything else to go faster.

Not content with having designed, built, and driven to 367.8 m.p.h. a fourengined super-hotrod called Challenger I, Mickey Thompson, 31, of El Monte, Cal., is already dreaming about a gas-turbine job that might do 500.

An impatient, energetic man, Thompson often wishes he didn't have to sleep. To make the most of what he considers



#### In driving position, Thompson's knees are almost on

a time-wasting handicap, he keeps a pen and a pencil beside his bed. They are there to trap sudden inspirations (which often come to him in wakeful intervals between grudged snoozes) for coaxing more speed out of automobile engines.

"Mickey does his best thinking and builds his best cars in the middle of the

night," says his pert blond wife.

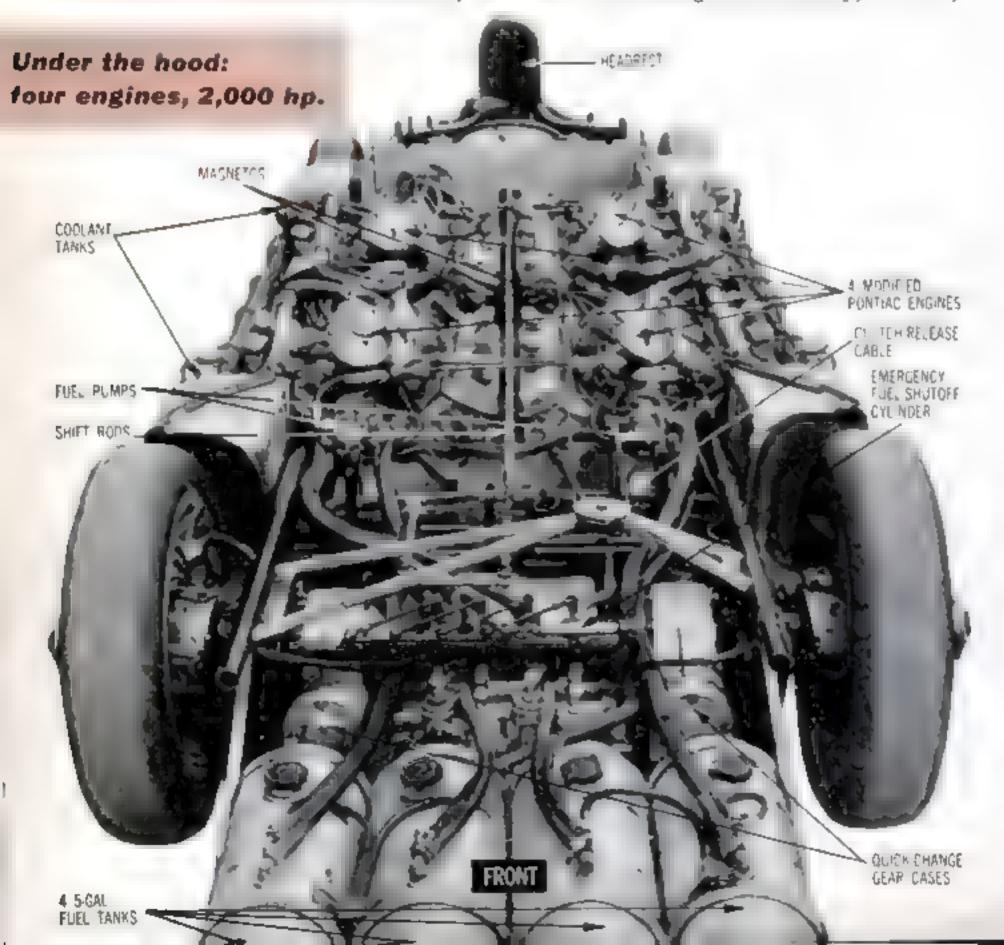
Many wives would find this practice unsettling, but not Judy Thompson. She and her tall, hefty husband were high-school sweethearts. She was his devoted fan when he couldn't even go 90 m.p.h., and she still is.

Scratch-pad scheming. Until Thompson's gas-turbine dream materializes, though, Challenger I represents his—and the nation's—greatest triumph of scratch-pad scheming and backyard engineering In this 2,000-hp, sky-blue streamliner, on the Bonneville Salt Flats last October, he

Though failing to top the world's land-speed record of 394 2 m p.h., which he was doggedly trying to do, he succeeded in setting four lesser international speed marks. They were: 351 9 m p.h. for the flying five-kilometer, 342 5 for the flying five-mile, 325.6 for the flying 10-kilometer, and 282.7 for the flying 10-mile. And for one blazing mile, he traveled 367.8 m.p.h.

Challenger I is at least the eighth hotrod that Thompson has built since he was in 10th grade. All except the latest were constructed in spare moments. To build Challenger I, he took a leave of absence from his long-time job as a newspaper pressman in Los Angeles. He also sank all his savings in the project.

Thompson's father, a retired captain of detectives, says he might have guessed what was coming when Mickey, as a kid,



#### a level with his shoulders

preferred to play with car tools rather than toys. A few years older, he built a soapbox speedster with a washing-machine engine. In his mid-teens, he put a quickchange rear end in a Model A and managed to hit 89 m.p.h. He was the first person to accelerate from a standing start to more than 120 m.p.h. on a quarter-mile drag strip. Later, he was first to boost that speed to more than 150 m.p.h. in the same quarter-mile.

At 21, he drove his souped-up 1936 Ford coupe to 141 65 m.p.h. at Bonneville and copped the top-speed trophy for the car's class. He has been first in his class

five times on the salt flats.

In 1953 and 1954, to toughen nerves and sharpen his coordination for high-speed driving, Thompson entered the tragedy-haunted Mexican Road Racea. It was a grim experience. Both years, he overturned. The first spill came when he made a desperate effort to avoid spectators who had rushed into the road. The second rollover put him out of the running just after he had beaten the old first-day record by four minutes.

Fastest American. In 1958, in a home-built dragster with two fuel-injected Chrysler engines, one driving the front wheels, the other the rear, Thompson shot through the timing traps at Bonne-ville at 294 m.p.h., faster than any U. S. driver had ever traveled. But not fast

enough for Mickey Thompson.

He came away in a fever of impatience to "cobble up some machinery" that would do even better. The time had come, he was convinced, to try to go faster than anybody else in the world.

The present international land-speed record of 394.196 m.p.h. was set on the Utah salt flats by the late John R. Cobb, a British fur broker, in 1947. Cobb rode in the bulbous nose of a 26-foot monster that was eight feet wide, four feet high and weighed more than 7,000 pounds. Two 1,300-hp. engines powered it.

Mickey Thompson had a much smaller vehicle in mind. He set out to build the smallest car that could contain the power

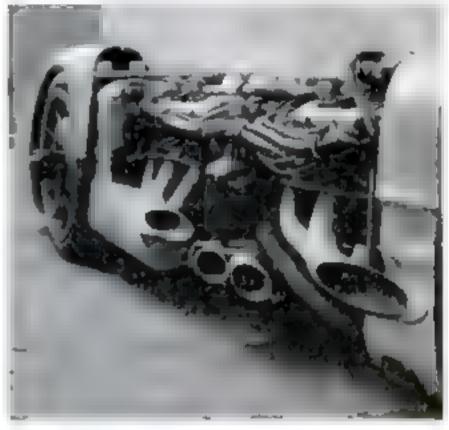
needed to beat Cobb's record.

He wound up with a vehicle 19 feet, seven inches long; five feet wide; 39 inches high; and weighing 5,600 pounds.

"It's damn small for the amount of



INSTRUMENTS are scattered all over. Held here by mechanic are some that go on panel: two tachs, four oil-pressure gauges, two oil-temp gauges. Others are under seat and at sides.



FOR COOLING, Challenger I has four separate water tanks and pumps. The tanks are weirdly shaped to fit behind front wheels and ahead of rear ones. The left-front tank is shown here.



FIVE NOSTRILS in Challenger I's nose scoop in air. As the vehicle hurtles forward, air is rammed to build up pressure around the fuel-injected engines and produce supercharging.



A PAIR OF DRAG CHUTES is packed in that horseshoe shaped cavity at lower right. When fired out the rear, they hauled the car down from 362 m.p.h. to 70 in a space of two miles.

engine," a mechanic who worked on it said. "Alongside Cobb's beast, it would look like a kiddy car!"

Before Thompson would begin to build it, however, he had to be assured of obtaining tires that could take 400 m.p.h.

Jet-type tires. With a flurry of appeals to tire makers, Thompson won a quick response from Goodyear. The company told him to go ahead and build his car; Goodyear engineers would come up with dependable tires for it. At a cost of more than \$50,000 in research, they did

The 7.00-by-21 tires developed for Challenger I are much like jet-plane tires. They are tubeless, five inches wide, made of natural rubber, and have an overall diameter of 29.60 inches. They have flat tops to increase tread area on the ground. The tread itself is as plain as a sheet of paper, to lessen friction. The basic design calls for a tread only .08 of an inch thick. For Thompson's high-speed runs, lasting only a couple of minutes, the tread was further thinned to .02 of an inch. This was done to reduce the enormous centrifugal force the tires developed at speeds near 400 m.p.h.

There is no rubber on the sidewalls. The nylon cords of the six plies are covered merely with a coat of black paint.

Halibrand Corp. built 21-inch magnesium wheels, designed to Goodyear specifications, to hold the tires, which are inflated to 100 p.s.i.

While the tires were being created, Thompson went ahead with the powerhouse that was to ride on them. No blueprints needed. A high-school graduate with no formal training in engineering, Thompson is nonetheless a born engineer, friendly experts say. He has picked up a lot of know-how by trial-and-error. Beyond this, inspired ingenuity and shrewdness have bolstered his ability. He never makes a blueprint. But his closest collaborators—Fritz Voight, a mechanic and garage owner, and Don Borth, a body builder—don't need drawings to carry out his inspirations. In addition, he had the eager help of a skilled group of worshipful young hotrodders.

Working sometimes 20 hours a day under Thompson's driving leadership, and using military-surplus hardware as much as possible, these men and boys put

Challenger I together.

Thompson knew from the start that he wanted a "slingshot" vehicle. Hotrodders in Los Angeles, which has been called the Holy Land of the clan, claim that he invented the slingshot dragster. If this is so, and he thinks it is, he created the fastest sprint car known. It gets its name from the fact that most of the weight is at the rear, where it helps provide maximum traction. With the engine or engines slung in the middle of the chassis, the driver rides either over the rear axle or out behind it.

Thompson's seat in Challenger I is a scoop of metal in which he reclines with only the lower part of his legs over the rear axle. In driving position, his body held tightly in place by shoulder harness and a seat belt, his knees are almost on

a level with his shoulders.

Four hot mills. To power his hottest hotrod, Thompson chose four 1959 Pon-

[Continued on page 218]

#### PS EXTRA: YOUR TEAR-OUT BOOKLET NO. 15



To remove the booklet, place your left hand on this page and grasp the booklet with your right. Then pull it gently away. After reading, file for future reference.

98 POPULAR SCIENCE DECEMBER 1959



The Gote's easily lifted onto a pickup.



Cleat holds it steady on its kick stand.



For off-road travel up and down hill, through brush.

#### MOUNTAIN GOAT ON WHEELS

This scooter is for rough work. It takes rider and pal-or a 180-pound buck-up a 25-percent grade without strain. The three-hp. Tote Gote weighs 108 pounds, goes by car, station wagon, or pickup to

the end of the road, then travels on its own. Its three-quart tank will take you 30 miles. Ralph Bonham, Provo, Utah, built the first scooter for hunting and fishing trips, now makes them for sale.

HEAT CREAM, You're right. The GI in the photo is having face make-up put on-but it's for a march in the searing heat of the Arizona sun,

He's using a thermal face cream. It's intended to protect the skin from atomic flash. Two kinds are under test by the Army Quartermaster Corps. One has a water-in-oil base modified by latex, the other uses the latex alone.



## Polaroid Brings Qut Super-Speed Film



T'S so fast you can snap photos by ordinary room light alone. The new Polaroid Picture Roll, rated at 3,000 A S A., is 15 times faster than the standard picture-in-a-minute roll. Even conventional film cannot match that amazing speed, except by spe-

cial forced development.

A gadget bagful of accessories offered with the 3,000-speed film makes it usable

anywhere, by anyone.

For indoor shots there is something called a "wink light" and an auxiliary flasher. The wink light uses a 12-volt autodashboard-type bulb, momentarily lighted by a pulse of juice from a 45-volt dry cell and condenser. One battery gives over 1,000 "winks" just bright enough to fill in shadows cast by normal room lights.

The flasher is a tiny reflector that plugs

into the wink light and fires AG-1 flashbulbs, the cheapest made. Its head swivels to direct flash, vertical bounce or horizontal-bounce flash position. The flasher is needed only for distant shots in poor light, or as the sole light source.

Outdoors, with a film that takes clear pictures at dusk, the problem is too much light. Polaroid's simplest answer to this is a four-stop neutral density filter. You snap it over the lens and pretend the film has a speed of only 200 A.S.A. The instruction book or an exposure meter-Polaroid offers an especially sensitive one —tells what camera setting to use.

For the last word in automatic picturetaking outdoors there is a photoelectric shutter. This clamps over the lens instead of the filter. It cuts out much of the brightness with a tiny fixed opening of f/54. A photocell matches light to film automatically by setting the shutter to one of seven speeds from 1/1,000 to 1/10 second.

#### and Accessories for Shooting



Outdoors, the photoelectric shutter sets exposure and eliminates focusing Both shots were made just by pointing camera and cheking. Photocell set the shutter speed

for correct exposure. Fixed f/54 opening put everything in focus from 31/2 feet to infinity.



Low-level wink light fills in shadows from ordinary room lighting

New 3,000-speed film made the photo at left by the light of a 150-watt bulb shining through thick diffuser, heavy shade. Same shot, this time with a wink light on camera, produced better picture on the right. Wink light works best between eight and 10 feet from a subject.

#### Pictures-in-a-Minute Anywhere

COMPLETE OUTFIT for using 3,000-speed picture roll includes, besides Polaroid Land camera: a) wink light that slips onto the camera's lower right sideshoe on the light slides into camera slot, making electrical contact, b) flusher that plugs into two holes in top of wink light and uses the same 45-volt battery (AG-1 flashbulb fits into flasher); c) four-stop neutral density filter that enaps over camera lens; d) photoelectric shutter that clamps onto the camera's lens mount.



No doubt about it, human beings are getting bigger. Kids grow faster, end up taller. What's happening, anyway?

## Are We Growing into Giants?

#### By Lawrence Galton

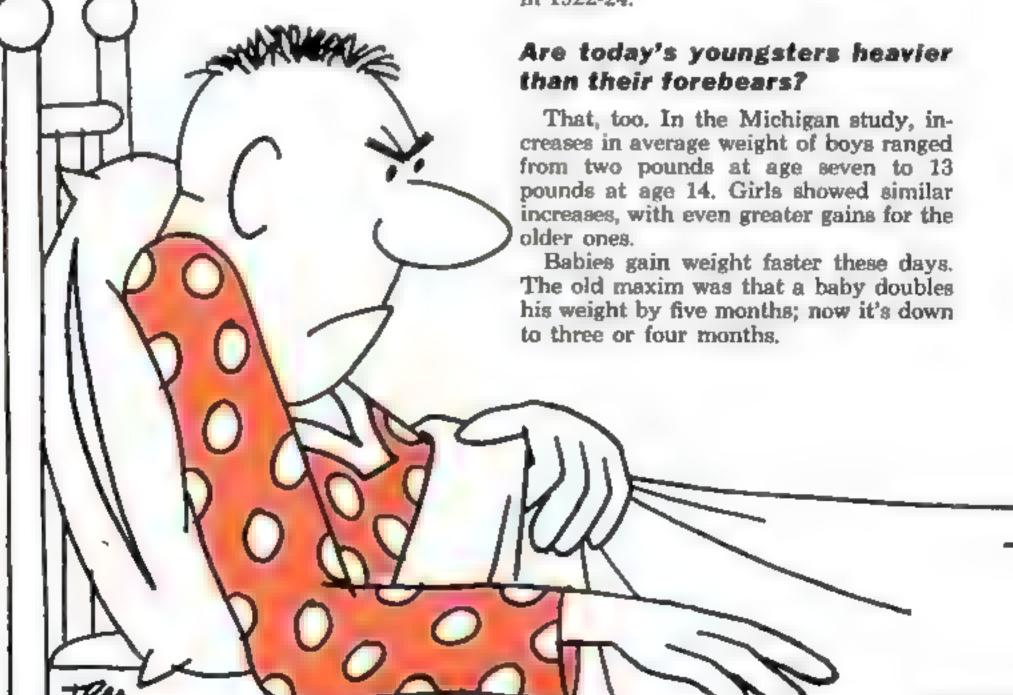
Are future generations likely to be even bigger? If you're a parent, how tall will your youngster be? If you're a teen-ager, are you worried about when you'll stop growing? What are the reasons for increasing size? What are the implications of increasing human size for our future homes, clothes, cars, and furniture?

Growth, always a source of speculation, today is a subject for increasing scientific interest. Here are some of the latest research findings in the continuing study of human growth—along with some thoughts about the future.

## Are today's children really taller?

No question about it. Even 15 years ago, a study showed that a one-year-old infant was seven percent taller than his 19th-century counterpart and that nine-to 14-year-old boys were six to eight percent taller.

More recently, a 1954 study of 3,318 Michigan school children showed them to be consistently taller than a group studied in 1937-1939. Boys under nine averaged about a half-inch taller, while at nine and over, they showed an increase of an inch or more. Among girls, the difference was an extra inch as early as age eight. The average 13-year-old boy in 1954 measured 60.7 inches as against 59.5 inches for 1937-39 and 59.1 inches in 1922-24.



## Are children reaching full growth sooner?

Yes, Adult height now is attained at a somewhat earlier age than in the past, according to Metropolitan Life Insurance Company statistics. A German investigator has found that maximum height is often reached by the age of 20. A century ago that was rare. An English study has shown that the average British male now reaches maximum height when he is 21½ years old, versus 26 years in 1880.

#### Is adult stature increasing?

Yes. It isn't just that kids are growing faster; they also end up taller. The average height of 20-to-29-year-old men examined at induction stations in May. 1943, was 68.15 inches—about two-thirds of an inch more than in 1917. And the proportion of taller men increased: More than 27 percent of the 1943 selectees were five feet 10 inches or more, as against 22 percent of the 1917 men. The number of six-footers jumped from 6.5 to 8.8 percent! More recently, a study compared heights of children with heights of their parents. It showed that American boys at maturity now average about an inch taller than their fathers, and girls average about 1.4 inches taller than their mothers.

### What has been the general rate of increase in stature?

People have been getting taller at a rate of about one centimeter—about two-fifths of an inch—every decade, says Dr. Stanley M. Garn of the Fels Research Institute for the Study of Human Development.

People have been getting taller at a rate of about the origins of an inch every decade says one authority.

## Are we getting bigger in other ways?

Yes, in a number of ways. Our feet are bigger. According to a leather-industry source, our feet have been growing one-third of an inch every 20 years. The average man today wears a size nine to 10 shoe; his grandfather wore a seven. The average woman now wears a size seven to 7½ as against a four for her grandmother.

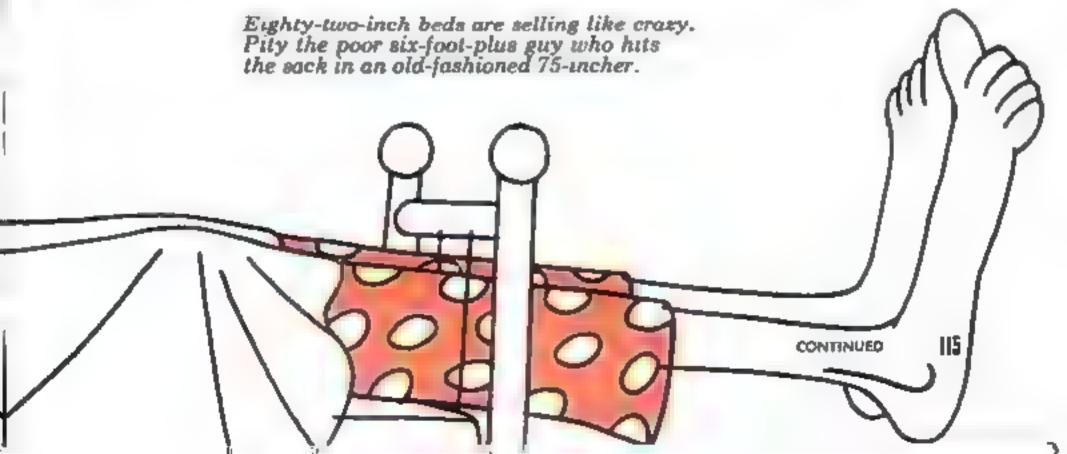
Men, it would seem, are cutting a handsomer figure—for, along with increased height, they're now, on the average, 1½ inches larger around the chest (36.38) yet no bigger around the waist

(30.63) than 25 years ago.

But hips are bigger. To be comfortable the average American man now needs a seat 22 to 24 inches wide, seating experts say. Old-world opera houses like Milan's La Scala get along with 18- and 19-inch seat widths, but architects for New York's Lincoln Center for Performing Arts have had to reckon with new proportions: To accommodate the same number of music lovers and still be acoustically sound, the new opera house will have to be a third larger.

No one can say Detroit isn't aware of the problem either. Car designers keep promising better hip room every year.

One pleasant note: Women seem to have retained their proportions; they may be even slimmer-hipped than before.



## When did these increases in size start?

Apparently only in the last century. According to one authority, it can't go back unrestrictedly to earlier centuries. If it did, men of the 15th century would have almost been dwarfs. His belief is that our progressive increase in height probably began after 1830.

## What's the reason for all the growth?

It's only partially understood. Certainly, increased calorie intake and improved nutrition are factors. There's much evidence for this. For example. Japanese children in this countrv who have been fed a typically American diet have grown considerably taller than children of the same economic level in Japan. But improved nutrition doesn't fully explain the increased growth of economically preferred classes who have eaten well for generations.

The reduced incidence of childhood illness is believed to be important. A re-

cent British study of 650 boys and girls—and their colds, respiratory infections, and other illnesses, and the effects these had on the growing ends of the long bones—indicates that illness has a definite stunting effect on growth.

#### What effects have there been on home furnishings?

Beds are getting longer. A bed is supposed to be six inches longer than the sleeper. The once-standard 75-inch length is giving way to 80- to 82-inch lengths which are now regularly available, reports the National Association of Bedding Manufacturers.

Kitchen counters are getting higher. The appliance industry is now making ranges and other appliances with extenders built into their legs to allow them to be raised up to three inches. Kitchencabinet systems are being developed to utilize the space between the seven- and eight-foot line which, in the past, was thought to be too high.

## Do we now need more living space per person?

"THEY'VE put me on a different assembly line at the truck plant," said Alex. "I'm working on trucks with right-hand drives."

"Right-hand drives? I didn't know you shipped cars to England."

"We aren't. These light trucks are for use right here in the U.S.A."

"News to me," admitted his friend.
"I never saw any. What good is right-hand drive in this country where everybody has to drive on the right-hand side of the road?"

"Not much usually. But for their purpose, these trucks are ideal."

... How Come?

AND LER, They're muit trucks, mude to that R.F.D. with right-hand drive so that R.F.D. carriers can stop by and service mail boxes on the right-hand side of the road. Made by the Big Three, the mail trucks are finished in aundard red, while, and blue.

It looks like it and we may get it.

Because there is a far greater occurrence of heights in excess of six feet six, reports the National Association of Home Builders, it has introduced some adjustments in its recent research houses. Interior doors are eight feet—high—running to the ceiling—to accommodate tall people with hats on.

Also, eight-foothigh closets, which provide more space for storing long garments, are growing in popularity among buyers of new homes.

## How big are we likely to get?

Nobody knows. It's possible that the day of the seven-foot boy with the size 15 feet and his six-foot-five girl friend may not be too distant.

But despite a definite trend toward bigness, you can't project it too far ahead, Dr. Garn notes. It could change, he beheves, and points to the fact that during the Napoleonic wars stature went in the opposite direction.

Dr. Harry L. Shapiro, chairman of the American Museum of Natural History's anthropology department, had this to say:

"A highly respected scientific friend of mine has suggested that human evolution may be entering a phase of giantism. That

[Continued on page 228]



Tail is like a wind tunnel.

#### FAN-WINGED PLANE FLIES STRAIGHT UP AND DOWN



With covers off to show rotor wells, Omniplane looks like this.

Ground tests have begun on a strange craft. It's Vanguard's Omniplane, designed for quicker vertical takeoff, faster forward speed than a helicopter or a tilt-wing. Prospective uses are for low-level attack at 200 mph., personnel and materiel transport, air-sea rescue, anti-submarine defense

The plane has a three-bladed rotor mounted in a duct in each wing for takeoff, hovering, landing. It's flown horizontally by a ducted pusher propeller in the tail. During transition, covers fitted above and below the rotors close down to provide conventional wing configuration. Top ones are flat, the lower ones built like Venetian blinds.



Top and bottom shut for normal flight.

#### HORN CALLS MEN LOST IN WOODS

The newest way to rescue hunters and hikers lost in the New Hampshire woods is to call them out of the forest with the compressed-air horn at right.

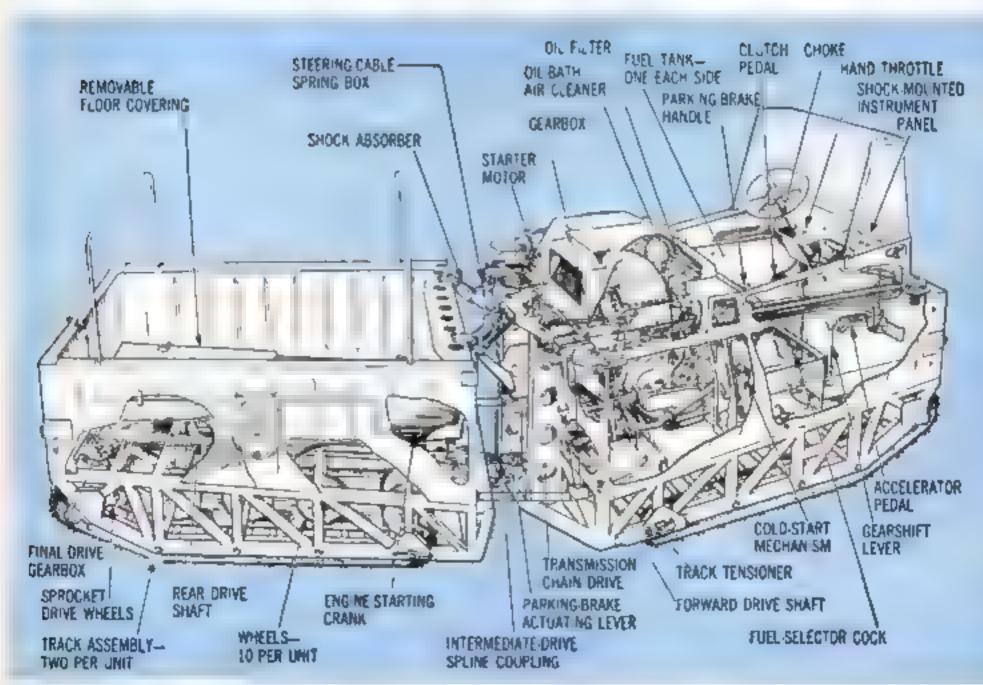
Conservation officers say the big horn's bellow can be heard up to 12 miles away. In its first season it saved 42 sportsmen who had gone astray.

When an alarm comes in, the horn is driven as far into the woods as possible. It's blown every minute or two, night and day.





## Canadian RAT can scurry anywhere





# Powered by a VW engine, this wide-track flyweight hauls half a ton over land or water

### By Edmund Christopherson

WHILE back the Canadian Army realized it needed a small rig for carting men and light equipment around the wild Arctic countryside. In winter, at 70 below, ice and snow blanket everything. In summer the muskeg thaws into goo that traps land vehicles, yet isn't wet enough to float any kind of boat.

The Army tossed its problem to the special project engineers at Canadair Ltd., aircraft and mussile manufacturers in Montreal. What the Army got was the Rat, a 1,500-pound aluminum-bodied amphibian that:

Travels over ice, snow, mud, swamp,
 or deep water at up to 10 m.p.h.

 Climbs 60-percent grades in snow and 80-percent slopes over grass.

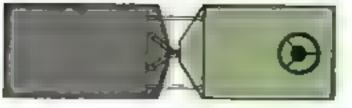
 Carries a half-ton payload and can pull another 1,000 pounds on a toboggan.  Consumes only 1 2 gallons of gas an hour in its air-cooled, 36-hp. engine

Scores of Rats now scurry over the Canadian northland. They're used for game management, exploration, firefighting, policing, and medical and missionary work. In the U.S. there are Rat-equipped mosquito-control crews and transmissionline patrols. A few recreation places use them to tow skiers.

36-HP. VW ENGINE mounted behind the driver's seat is a standard outo power plant, though turned end for end. Special heavy-duty gearbox has gear ratios similar to VW sedans.





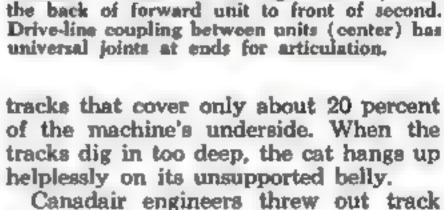




RAT IS STEERED by changing the angle between front and rear units with two cables.



IT TAKES MUSCLE to handle Rat's stiff, fastacting steering wheel. Left foot works clutch, right foot the gas. There's no foot brake; you stop Rat by taking it out of gear,



STEERING CABLES run through sheaves, from

Driving the Rat is like piloting a small ship. You turn the wheel and her stern section pivots as a rudder would. It takes only a few turns to put the wheel hard over, causing Rat to chase its tail in a 12-foot-diameter circle. There's no danger of jackknifing the rear unit, but you have to watch oversteer. To make a right angle turn, for example, you have to take most of the "rudder" off about halfway around.

Canadair engineers threw out track steering in favor of articulating two closely coupled units—a method used on the largest earthmovers. They were then able to cover virtually the entire underbelly of both four-by-six-foot units with tracks. Fully loaded, each square inch of tread supports only half a pound. And if one unit gets stuck, all the power goes to the other unit's tracks.

Despite its small engine, Rat clatters over seemingly impossible terrain undaunted. First gear is for mountain climbing, second handles rough ground and marsh, third takes her through open country, and in fourth on pavement she'll do almost 30 m p.h.

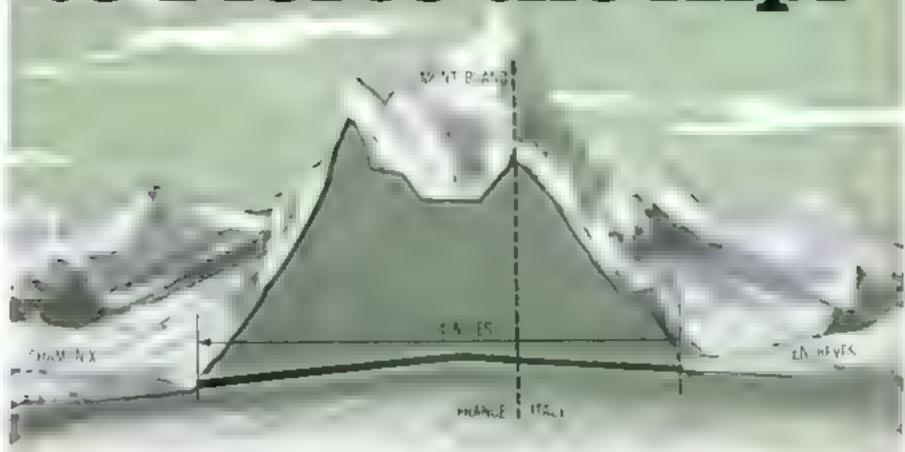
Why the VW engine? Because it is aircooled, lightweight, reliable, and available worldwide. Canadair designed its own gearbox: a manual-shift, four-speed, synchromesh job.

Rat vs. cat. The usual tractor, tank, or half-track is stubby, with relatively narrow tracks so one track can be slowed down to steer. Besides a tendency to nose up in snow and to bunch snow or mud in front of itself when turning, such a vehicle bogs down in soft stuff. The heavy, orthodox "cat" carries its weight on

For below-zero starts, Rat can be fitted with an ether-capsule system. This squirts ether into the carburetor intake for a fast start. The amphibian can be hand-cranked if the battery fails.

Want to buy a Rat? Canadair sells them for \$12,000.

# World's Longest Auto Tunnel to Pierce the Alps



Some of Europe's toughest driving will disappear when they complete this tunnel that puts Paris-Rome motorists on a crow's-flight line

### By Gardner Soule

HE hard way of getting from Paris to Rome, or vice versa, is by car through the Alps. It is perilous to heart, gearbox, and time schedule.

The only scenery you see is the road, writhing shead of you in a succession of unbanked zigzags. Your eye leaves it only for quick blinks at the temperature gauge, which shows that your engine is laboring on the edge of heat prostration. Your shifting ranges between second and third on the European four-speed gearbox. For brief seconds, occasionally, you break into high gear—dangerously, on downslopes—in the vain hope of scooping cooling air into the engine.

This is in summer. In winter, the roads are impassable. Wide detours can easily add a day or more to driving time.

Now, however, relief is in sight. The mountain barrier that has separated France from Italy, northern Europe from southern Europe, is to become a connectONLY 35 MINUTES to Italy by the tunnel under Mont Blanc, proclaims this road sign near Chamonix, French terminal of the tunnel.



ON ITALIAN SIDE, snow-covered Mont Blanc looms over workings and worker. Diggers face great temperature extremes: 100 degrees F. or more in tunnel, below zero outside in winter.

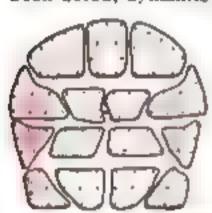


### American inventions-Jumbo, mucker, cherry-picker-

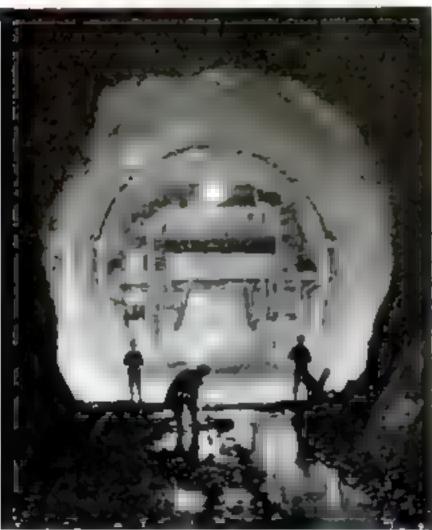


HIGH-SPEED PNEUMATIC DRILL mounted on "pusher leg" support can pierce hard granite at 20 inches a minute. Three-tiered Jumbo drilling platform permits 18 drillers to work at once.

DRIU. PATTERN shown here must be carefully followed by drillers. When the 121 holes have been bored, dynamite charges are inserted and



Jumbo is rolled back on rails until the blast has gone off Photo below is of Italian version of Jumbo. On French side, Jumbo includes a ramp system for small rail cars that haul off debris. Jumbos are custom-built on the digging site to match the tunnel.



ing link. Right through some of the tallest mountains—in fact, almost beneath Mont Blanc, at 15,781 feet Europe's highest—there is being built the Trans-Alpine Highway Tunnel, called for short the Mont Blanc Tunnel. It will be the longest highway tunnel in the world.

Year-round passage. Paris and Rome, the two cities tourists most want to visit, will be connected as the crow flies. The tunnel will cut the distance between the two capitals by 125 miles—from 1,005 miles to 880.

In winter, when autoists are candidates for rescue by brandy-toting St. Bernard dogs, it will remain snow-free—and open. It will make unnecessary the present long detour almost to the Mediterranean.

When it's finished, in about two years, the 74-mile Mont Blanc tunnel will be three times the length of today's longest highway tube: the Honshu-Kyushu tunnel in Japan, over two miles long. Next longest today, just over two miles, is the Mersey River tube at Liverpool, England. America's longest highway tunnel is New York City's Brooklyn-Battery passage, 9,117 feet.

Driving southeast from Paris, you'll

**VENTILATION DUCTS** follow diggers. Air is pumped into the tunnel by giant 200-hp. fans, scheduled to be placed approximately a mile apart. Ducts are a meter—39.4 inches—across.



122 POPULAR SCIENCE DECEMBER 1959

### speed the tunneling

ride toward the tunnel on the beautiful French Route Blanche (White Way). You'll enter Switzerland briefly and pass through Geneva, high spot for tourists.

Then you'll re-enter France and take the Arve River road to the entrance of the tunnel, at the town of Chamonix. You'll make a short climb to the tunnel entrance at an elevation of 4,179 feet. As altitudes on Alpine highways go, this is low; that's to insure that the approach road is free from snow at all times. To-day's snow-filled roads cross the Alps at around 6,500 feet.

You'll pay a toll (not yet determined) and enter the single lane that will carry you the longest distance you can drive underground. The roadway, 23 feet wide, will have one lane in each direction.

Something new in lighting. As in other tunnels, you'll switch on parking lights only. A slight curve will shut out glare from the entrance behind you. Another, at the other end, will keep you from facing into a bright pinprick of light at the exit.

For the first 1,640 feet from the entrance, the electric lighting will be graduated. Photoelectric cells will measure

LITTLE JUMBO rolls on rails into small access tunnel, off main tunnel, on the French side. It weighs three tons. Big three-decker Jumbo shown on facing page weighs about 75 tons.





ZIGZAG ROAD creates illusion that ears are all abreast. Actually they're in single line. Road is typical of twisty Alpine driving.

light coming in from the entrance and automatically regulate the internal lighting accordingly. To reduce eye strain, the tunnel lighting will dim from both ends toward the center.

You'll never need to be ill at ease on the long underground drive, because you'll never be far from help.

Service stations, with mechanics, spare parts, and gasoline, will be only 1,000 feet apart, all the way through.

Even so, should you not be able to reach the station, a phone call will bring gas (via scooter delivery) at once. There will be a phone every 325 feet. These will be set in small niches intended as resting places for pedestrians. A 27-inch walk on each side of the road will accommodate hikers and stranded motorists.

A profusion of French and Italian policemen in cars, on motor scooters, and in niches along the tunnel walls will keep you moving at around 30 m.p.h.

Space to turn around in. If in emergency you should have to turn your car around and return where you came from, there will be frequent transverse cuts—16 feet by 27 feet—to make it easy.

You'll climb 352 feet from France to Italy as you go through the tunnel. This difference in height of the entrances will give the tube a chimney-like draft that will provide about 20 percent of the necessary ventilation. The other 80 percent will come from electric blowers that will move air through two conduits beneath the roadway at the rate of 636,000 cubic feet a minute.

Fumes and stale air will be removed through ducts in the ceiling.

Roadway, ceiling, and sides will be concrete. The roof will be about 20 feet

### New Ideas from the Inventors



Plane Lands on Wheels or Skis. If he had to set down on a snow-covered field, the pilot of a plane equipped with this recently patented landing gear could just

lower a pair of skis below wheel level. Moved by hydraulic cylinders, the skis might also serve as jacks for changing tires or freeing mud-mired wheels.

Spoon Cuts Grapefruit Sections. With a saw-edged spoon like this you could eat grapefruit without mangling it or equirting juice around. Though blunt to prevent cutting your mouth, the square and V-shaped notches would sever fruit sections quickly and cleanly.

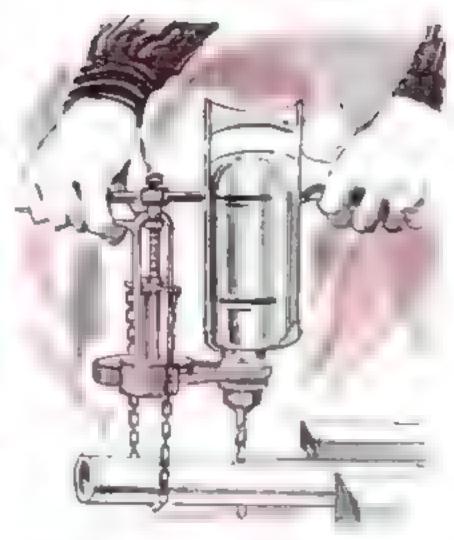
Light Level Turns On Lights. You'd never neglect to turn on your car's head-lights at dusk, or on entering a tunnel, if they were controlled by a GM-patented photocell. It is designed to measure daylight level and (when the motor is running) switch on lights automatically.





124 POPULAR SCIENCE DECEMBER 1959



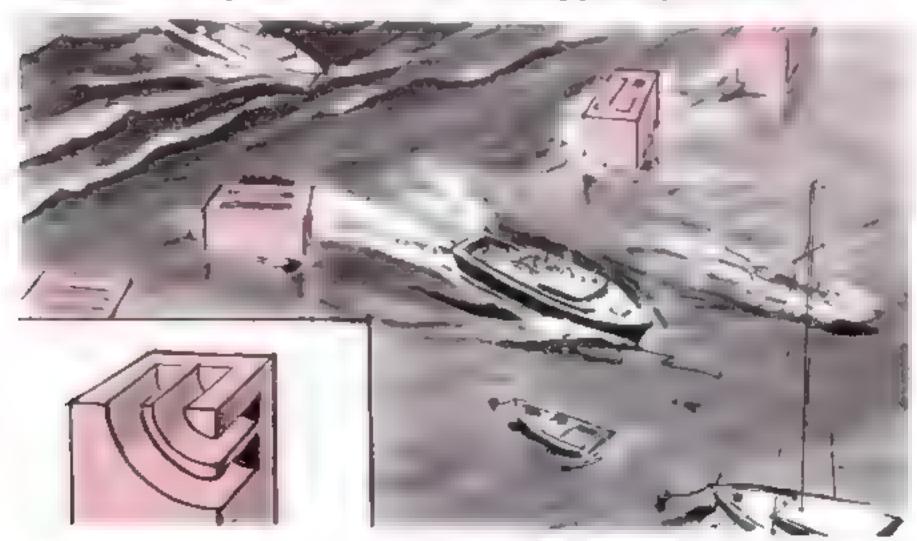


Lever Gives Shovel a Lift. With a fulcrum to help you scoop up packed snow and a second handle for a better grip, this shovel could ease your path-clearing labors. A spring would normally hold the fulcrum flat against the shank; to lower it, you'd pull on the second handle.

Chain Feeds In Drill. Clamp it to an auxiliary handle, and this attachment is supposed to feed a drill into the work, saving you effort. Turned by the chuck through a belt and pulley, a screw shaft would feed the drill by pulling up on a chain fastened to, or around, the work.

Wave Trap Calms Harbor. By using sea pressure to calm swells, "hydraulic resonators" might create a calm zone inside a harbor. Incoming waves would dash

against the specially chambered structures, which would hold the water for a moment, then spill it into the troughs, reducing peak-to-peak variations.



### More Inventors' Ideas



Bag Cleans and Racks Brushes. A paintbrush could clean itself between jobs if stored in its own plastic bag containing solvent. You'd tape the handle to an upright rod to keep the bristles hanging straight. Wire racks for the bags could be shaped to stand up or hang from mils.

This flexible-shaft tool is designed to help lift and guide a spare, making tire changing a less strenuous job. You'd stand the wheel upright on the ground, slip the threaded cable ends through two holes, and screw them onto lugs on the hub. Pulling outward on the handle would then raise the wheel and slide it into position.





Car Laundry Comes to You. Need a car wash? With sprays and rotating brushes carried and powered by a lift truck, this mobile laundry could do the job in your driveway. The scrubber might provide neighborhood route service or let you order a car wash by phone.

Enjoyee of potent may be ordered by number from the function of Pat of Rahington 25 DE at 25 cents on b. In a title to an incentur of the address given one erasuable cent on may address from the name and put no name bett in case of the former some of Patents.

# The Durable Tale of Hattie the Hitchhiker



By Louis C. Jones

Investor New York State Historical Association

PHIL CARTER had been through a hard day. He had called on 17 customers between Lake George and Schenectady and none of them could make up his mind without a struggle Now it was almost 11 o'clock, the rain was coming down in buckets, and there was still 10 miles to go before he reached home in Albany.

As the rain grew more blinding, Phil slowed to a crawl. There was a film on the inside of the windshield and he took out his handkerchief and wiped it off. As he was putting his handkerchief back in his pocket, he saw her. A frail figure all in white, standing by the side of the road, the thin girl was the loneliest sight he had ever seen in his life. She neither raised her hand nor moved her head as he pulled to a stop beside her and cranked down the window.

"Ride?"

She moved toward the car and he opened the door. She hesitated for a moment before getting in but then slid onto the seat.

"Going to Albany?" Phil asked.
"Yes." It was almost a whisper.

"You live there?"

"Please take me home. I live at the corner of Quail and Mercer Streets. Just take me home." Her voice had all the loneliness he had sensed when first he saw her in the headlights' glare.

PHIL drove on toward the city. It was evident that his passenger was in no mood for conversation. She huddled in the far corner of the seat, staring ahead and shivering in her wet dress. He reached behind him and without comment handed

her his light overcoat. She put it on and held it close about her as they drove slowly through the night.

As they reached the edge of town, Phil asked a single question, "What's your name?"

"Hattie Fairchild."

They turned off Madison Avenue at Quail and soon they were at Mercer Street. He pulled over to the curb and stopped. He was going to see her to the door but she was out and up the steps before he had the brake on. As she entered the house she paused and called out to him in a voice, now full of warmth, "Thank you, thank you." Then she was gone and he was sitting alone in the darkness.

IT WASN'T until he had put his car in the garage and started for home that he remembered his coat. The girl had taken it with her. Well, tomorrow would do to retrieve it.

The next day was Saturday, bright and springlike. In the afternoon he drove to Quail Street. He climbed the steps and, noting that the name on the doorbell was Fairchild, gave it a push. The woman who came to the door was tall, whitehaired, and reserved.

"Yes?"

"Could I speak to Hattie, please?"

"Hattie? I think there must be some mistake."

"No, I don't think so. I brought her home last night and she forgot to give me back my overcoat. I just thought I'd pick it up."

"Come inside, young man."

They went into the parlor. On the piano was Hattie's photograph—taken when she was gay and laughing, but Hattie none the less. Suddenly Phil realized that while

he was staring at the picture, his hostess was staring at him.

"Is that the girl you referred to?"

"Yes, ma'am, That's Hattie."

"You're right. That is my daughter Harriet. She was killed in an auto accident three years ago last night. Last year she tried to come home, too. I don't understand it. All I know is that she is buried in the old family plot."

They talked a while about this strange thing that had happened to them. The cemetery could not have been far from where he had taken the girl into his car. Puzzled and disturbed, he left the house and started driving. Before he realized where he was going he found himself at the cemetery gate. Slowly he turned in and parked the car. He got out and began to wander among the graves.

Then out of the corner of his eye he caught sight of it—the big stone marked FAIRCHILD and below it the smaller stone marked HARRIET. Across the top of the granite lay his overcoat.

THIS is one way the story is told and there are thousands of other ways, for probably no ghost story has been repeated so often in America as this one. Like other stories that people tell and retell, changes take place with almost every telling But the core remains the same: someone, usually a young girl, is taken home by a stranger who then discovers that she is not a living person at all.

It was 40 years ago that I first heard it, in approximately the form I have told it Seventy-five years ago it was being told in the same parts about a young man on a horse who was going to a dance when he met a girl whom he took up before him, only to have her dicappear as they came close to her home. In China they have

long told it about a young man who was walking in the evening and found a girl crying by the roadside. He walked with her toward her home. As they approached her grave, she vanished.

So it goes—in Armenia, in Italy, in Hawaii, in Korea—different versions have long been told, suited to the time and the place and the ways of the people who tell it. Especially all over America since the automobile began to play an important part in our lives, men and women have told of Hattie and her homesick sisters.

During World War II the stories involved a nun who got in a car, often a taxi, and asked to be taken to the local nunnery. On the way she talked about the war, making predictions about its end. When they arrived at the nunnery she had vanished from the car, to be identified later as a beloved sister of the order who had recently died.

Stories of this type tend to be very specific—it was a particular road, a certain address, and it was told to the teller by someone whose first cousin knew the man to whom it happened. Try to pin down the facts, and you turn from one dead end to another.

To me as a folklorist, part of the interest lies in the fact that this is so often told as a true but unbelievable happening It is not told the way a "big lie" is told, but as a real experience of real people. This is the quality that story-tellers of the past always gave their tales. I find it good that in the age of science this ancient oral art can still survive.

The author is a Columbia University Ph.D. and Director of the New York State Historical Association, Cooperstown. Long known as a folklorist, he has recently published a book of ghostlore, Things That Go Bump in the Night (Hill and Wang).



### Where'd it come from?

Men's Hat Sizes: Supposedly they measure the diameter of your scalp—a "7½" means your head's about 22 inches around But in Colonial times the man who made most of the forms used for blocking hats was a bit rusty in the three Rs. His basic form was 5/32 inch too small in diameter. But so many hats were made from it that people got used to the "wrong" size numbers. Today they are accepted as standard by hat makers.





Two wires fed from drum. Cable-burying digger lays wires underground in six-inch-deep slits.

### HEAT CABLES KEEP FROST OFF ATHLETIC FIELD

Underground heating cables to keep playing fields free of frost are being laid in Britain by a new wire-burying plow. Mounted on a tractor's hydraulic linkage, the plow has a pair of sharp blades that slit the turf while feeding in two lengths of plastic-insulated wire. It can be steered independently of the tractor so successive pairs of wires can be spaced accurately.

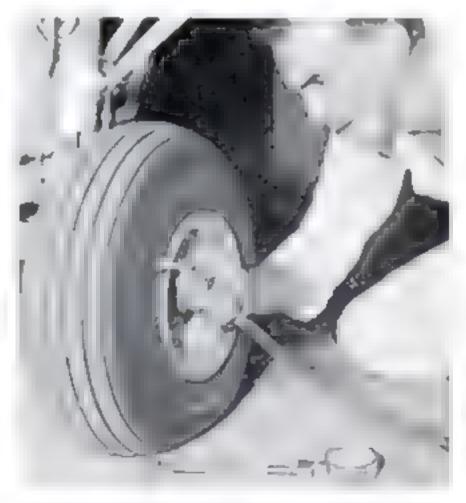
When all wire has been laid, open ends are joined and the continuous loop is connected to a power source.



Cutout shows even spacing.

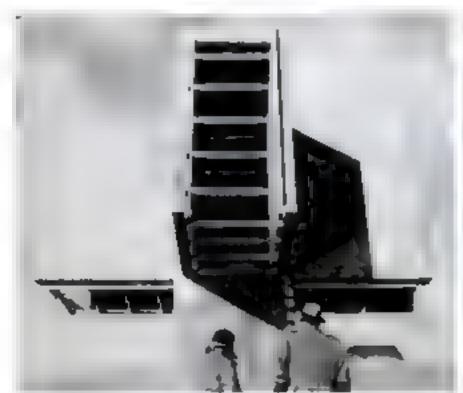


FUN TO BE SICK. Young hospital patients now take oxygen from a clown. As they suck a candy-striped hose, the clown's eye—a pressure gauge—rolls in friendly fashion. The nose is an emergency button to start artificial respiration.



SIDEWALL INFLATION. This aircraft tire is blown up like a football—by inserting an air-hose needle valve Goodyear designed the tire to get rid of valve stems, strengthen wheels. Six blue dots on sidewall mark points of inflation.







Four six-foot-high fins form giant cross . . . . . to keep reservoir well below flood level.

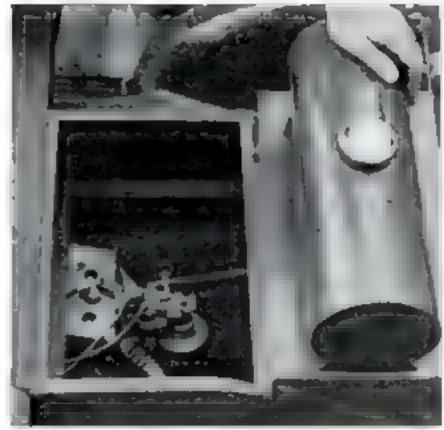
### FINNED SPILLWAY PROTECTS DAM

The fins on this concrete spillway opening are an anti-vortex device. They let flood water out of the reservoir slowly and evenly-no swirling like that from

a bathtub. The grilled outlets trap trash and logs, prevent clogging. The unit is part of a U.S. flood-prevention project near Berkeley Springs, W. Va.



HAND-FINISHED DASHBOARD of plywood holds a simple instrument panel. The clutch and brake are on the floor, a return to the old days.



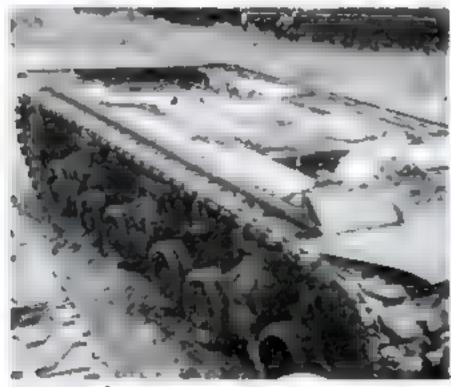
REAR-MOUNTED ENGINE is a four-hp., four-cycle gas power plant. It's made accessible by tilting the seat forward on a piano binge.

RESEMBLING a cut-down version of the famous Stutz Bearcat of the early 1920s, this little sports car has a nostalgic appeal. It's a Swift Cat, newest star of the small-car line put out by the Swift Manufacturing Co. of El Cajon, Cal

It has a laminated oak steering wheel, spun-brass headlamps with sealed beams, wire wheels, four-wheel brakes, 12-volt battery, fiberglass fenders and radiator on a steel body, and foam-rubber seats covered with simulated leather. It sells for \$995 fully equipped.

The little four-hp., four-cycle engine is rear-mounted under the seat, gives a top speed of 35 m.p.h., and gets 70 miles or more to the gallon of gas.

Overall length is just 80 inches on a 60-inch wheelbase. Width is 45 inches. The car weighs only 400 pounds.



Turret and top are cut off, running gear kept.



Powered by electric drive, it pulls gang plow.

### **TURNING TANKS INTO PLOWSHARES**

Surplus war tanks are being made over into farm tractors by R. G. LeTourneau at Longview, Tex. The company bought some 200, cut off the nickel-steel super-

structure for scrap. Then it bolted a DC electric motor to the transmission, connected it with a generator mounted on the floor. Result: a tractor for rough use.

Seated in the library of his West Orange, N. J., lab, Edison stares contentedly at the nickel-tron-alkaline battery it took him 10 years to perfect.

### Edison's

Everybody knows about Edison's light bulb. Few know the tale told here by the author of a new book on America's greatest inventor

### By Matthew Josephson

BY 1900 the Automobile Age had begun. In light coupes or phaetons powered by all sorts of steam and gasoline engines, or electric motors, some 3,000 Americans were already "burning up the roads."

Thomas Edison tried the early gas buggies and steamers and kindled to them at once. Edison allowed

that the horse was doomed. He foresaw a future in which millions would ride to business or pleasure in self-propelled carriages and trucks. He also ventured that most would be driven by electric motors and storage batteries.

Why electric cars? Compared with cars using steam engines, which were heavy, or gas engines, then most unreliable, the electric runabout was clean, light, and quiet. Carriage builders were producing "electrics" in goodly number, by installing lead batteries and small motors in a Stude-

baker or Columbia vehicle. But who knew as much as Edison about electrical machines? It was the right time, he judged, to enter this field and contrive a product more practical than any other.

He had remarked that electric runabouts had a radius limited to the vicinity of power stations; the lead-sulfur storage batteries then available were heavy, diffi-

cult to recharge correctly, and corroded quickly. Edison had experimented with lead batteries and thrown them aside. The claims for them were exaggerated. He once remarked, "When a man gets onto accumulators [storage batteries] his inherent capacity for lying comes out."

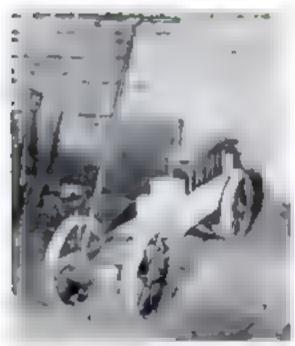
He defined the objectives for himself: to attempt an entirely new voltaic combination that would make his "box of electricity" light, durable, undeteriorating, quickly charge able, and economical. Such an instrument, he felt in 1900,



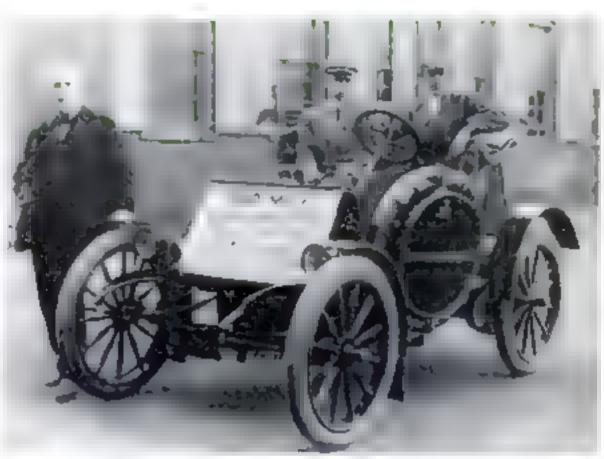
"Grand science, chemistry, I like it best of all," said Edison. The pursuit of the right chemical mix for the battery in thousands of tests fascinated the "old man,"

132 POPULAR SCIENCE DECEMBER 1959 Adopted by permission from a chapter in Edison. A Bingtophy (McGraw-Hill, N. Y.)

# Struggle to Build a Better Battery



A battery battering-ram: To test their strength, batteries were dropped three stories or rammed against brick walls on rigs like this.



Edwon believed electric core would triumph over "ill-smelling gas buggies." The 1910 Bailey electric completed a 1,000-mile run without a breakdown.

would "open up a new epoch in electricity." Lead batteries of the 1900 model gave four to six watt-hours per pound of battery. Edison's objective was to multiply such storage capacity and potential about threefold.

"Turning back the register." His idea at the start was to use an alkaline solution as his electrolyte, so that his metals would not be corroded. The negative element would be iron, or iron oxide On the choice of the positive element he was less decided; he would hunt for it. In his first ex-

periments he worked with copper oxide, then examined hundreds of other materials. By 1901, he had a force of about 90 persons, among them several accomplished physicists and chemists. Without regard for cost, samples of every known material were assembled, and every possible tool or device that could be of aid. The experiments mounted up into the

hundreds, then to the thousands; at over 10,000, Edison said, "we turned the register back to zero and started over again." A year, 18 months went by, and they had not even a clue.

If you tried to make the negative electrodes (iron) lighter, you increased deterioration. If you added something else, it created new variables. Then there were the tricky problems posed by the electrolyte, an alkaline solution of 25 percent caustic potash (KOH); this would not corrode



Eduson pretended he never stopped to rest, but he was often caught napping. Here he is on a bench, feet carefully avoiding a phonograph record.

### Two Ways to Store Electricity

metals, like sulfuric acid, but the cell capacity tended to drop off quickly. It seemed to need something to improve its conductivity. What that missing factor was would take a long time to find out. Then there was also a great drag hunt for the positive electrode. They tried cadmium, copper, cobalt, magnesium, and, after many trials, nickel hydrate.

Edison carried on his experiments by taking carbon strips

and filling their pores with every conceivable substance that might serve. Nickel hydrate, the most promising, was a poor conductor; to get an improved contact, Edison tested a great variety of conducting substances that might be mixed with the nickel hydrates. But that was not easily found either. Sometimes the nickel gave trouble; sometimes it was the pure iron. He kept a team of trained men working for long months to refine various grades of iron and nickel.

The patient quest. At 60, stout and round-faced and deafer than ever, Edison had nonetheless changed very little in spirit and method since he had invented the carbon-filament lamp 30 years earlier. There was the same abandonment to unending studies, no matter how difficult. His temper, to be sure, was a little shorter nowadays, sometimes violent when a clumsy mechanic upset things; but he continued to show an unfailing patience in the face of repeated disappointments.

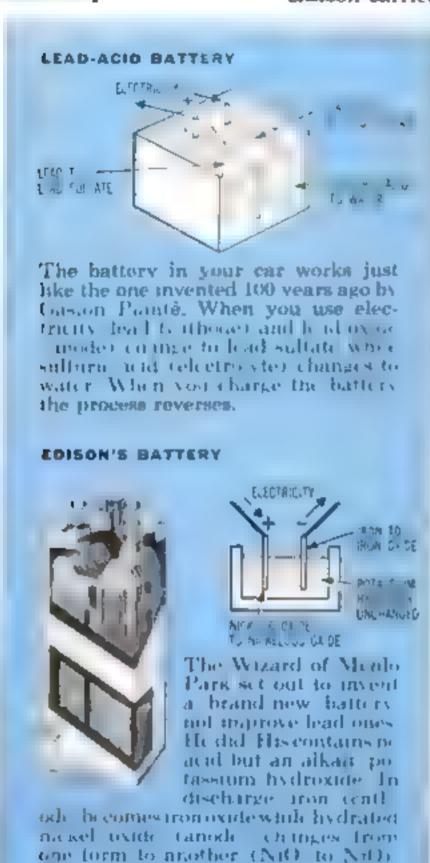
A Russian-born, Paris-trained chemist named Martin André Rosanoff, whom Edison engaged on the spur of the moment, reported for work early one morning in 1903.

Respectfully, Rosanoff asked to be informed about the laboratory rules and regulations. Edison spat on the floor (he was chewing tobacco) and said, "Hell, there ain't no rules around here! We're tryin' to accomplish somep'n."

He gave the utmost care to the design of an entirely new battery form. He evolved a novel structure of nickel-plated steel, the positive pockets being packed with nickel hydrate and the negative being of iron oxide. Graphite was mixed with the nickel hydrate filling the positive pockets.

At last, in 1903, he was ready to test his batteries. He installed them in carriages with a small electric motor and chain drive, and ran these vehicles over the rough country roads near Orange, N J. In his laboratory Edison also set up an apparatus that jolted his battery cells up and down, day and night, in simulation of heavy road usage.

Crash program. Tom Robins, the conveyor-belt inventor,



The potassium hydroxide relectro-

lyte) doesn't charge. Charging to

terses the process Edison true to

form invented the batters without

an wing an the chemical details --

some steps are still mysterious

dropped in one day. As the two men sat talking, there was a loud crash just outside the window as of some heavy object falling; then another, and another. Robins was alarmed, but Edison never turned a hair. After a while a workman came in and said, "Second floor okay, Mr. Edison."

Edison nodded. "Now try the third

floor."

To the wondering visitor he gravely explained that he was testing the endurance of his storage battery—by having packages of them thrown out of the windows of the upper floors of his laboratory.

At Silver Lake, N. J., in the summer of 1904, the manufacturing plant was made ready, special machine tools were set out, and 450 workmen were engaged. In the first season several thousand cells of the first battery model, the "E," were turned out. The demand far exceeded what Edison could supply; merchants and transport concerns had the batteries installed in delivery wagons and, at the outset, found their electric carriages highly convenient.

With his usual self-confidence Edison had started a rousing publicity campaign for his "revolutionary" storage battery, even before he was ready to manufacture it. He did a thorough advance-agent job, whetting the public's curiosity to a high pitch, so that when "The Wizard's Newest Marvel"

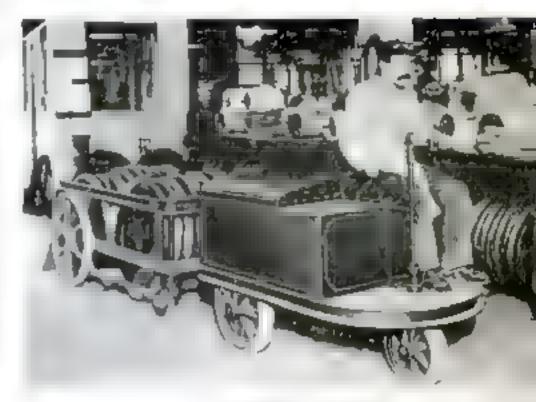
finally arrived people really believed it was such.

During 1903, and early in 1904, he announced that there would soon be "a miniature dynamo in every home . . . an automobile for every family," Men had said that no commercially successful battery could be made without lead. "The new battery means that another impossible thing has been accomplished." He concluded: "Yes, the new battery will settle the horse—not at once but by degrees. The price of automobiles will be reduced . . . In fact I hope that the time has nearly arrived when every man may not only be able to light his own house, but charge his own machinery, heat his rooms, cook his food, etc., by electricity, without depending on anyone else for these services."

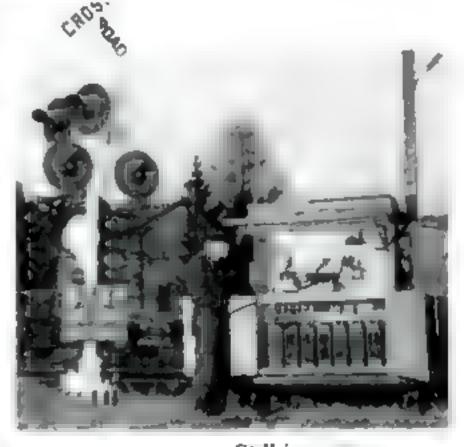
In short, he had "revolutionized the world of power," the newspapers reported;

he had brought forth "the age of stored electricity." The outlook for ill-smelling gas buggies seemed dark indeed.

Edison posed beside a spanking little red sulky, which had nickel-iron batteries and an electric motor. It was so easily run, he declared, that his 12-year-old boy Charles could drive it. With that he leaped on board and sped away at 20 miles an hour.



hdison batteries, too weak for cars, were fine for industrial use. This 1911 battery tractor speeded materials-handling in a tire plant.



Still in service, a
1912 seven-cell Edison
battery powers a
crossing signal of
the Delaware,
Lackawanna and
Western at
Ackermanville, Pa.

### HE FEELS LOW AS HE FLIES HIGH

An animated dummy named Gus shows what would happen to you at very high altitudes if you weren't protected by a pressurized cabin.

He sits in a vacuum chamber at Lowry Air Force Base. Col. There, he is used for demonstration in a physiological indoctrination course for some 250 pilots and passengers a month before jet

flights.

Gus is built to react to changes in pressure inside his transparent chamber corresponding to those at extreme altitudes. He assumes all the attitudes of humans under the same stresses, as shown at right. At 18,000 feet, his fingernails turn blue; at 23,000 feet, he is unconscious; and at 29,000 feet, he simulates hypoxia (lack of oxygen), a dangerous condition for jet pilots.



1. Gus is OK in his dome when the air pressure is normal.



2 At 18,000 feet his fingerwals hum blue



"FLYING DUCK." A hydrofoil version of the famous World War II DUKW, this amphibious craft does 50 m.p.h. on water. Avco Corp. powers it for the Army with a Lycoming gas turbine. It rises four feet out of the water at full speed.



PIGS PREFER POOCH. No puppy love this as two little pigs dine under the watchful eye of a motherly dog. Part of a litter of 18 on a farm at Pouxeoux, France, they proved too much for the sow to handle, so the dog took over.

#### PS PICTURE NEWS



3. He gets drowsy, lids droop at 23,000 feet.



4. His eyes close and his belly swells at near 28,000 feet.



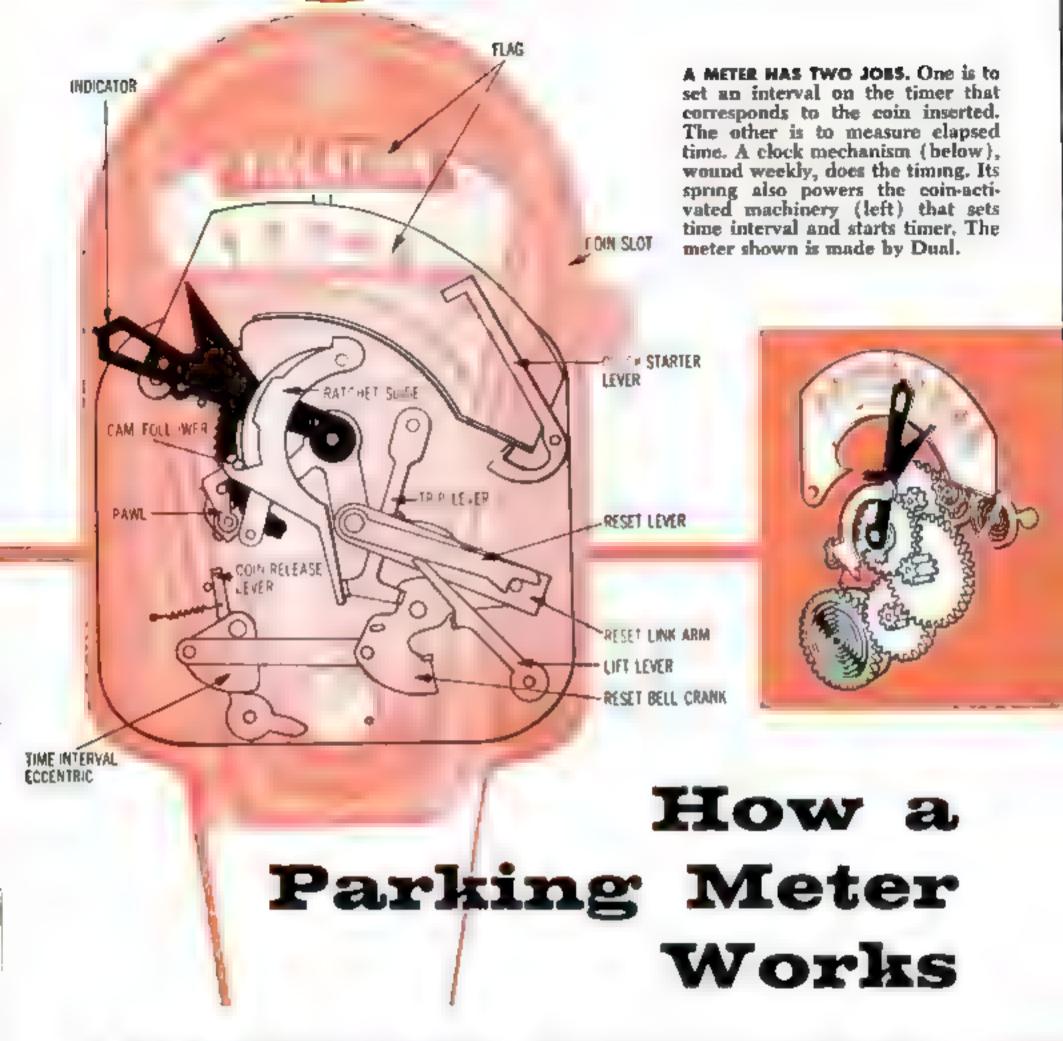
5. He's really gone now at 29,000 feet. You'd be, too.



ATOM PUP TENT. A plastic-andmetal crib seems to please the Army baby above. It's a self-contained unit shown at Fort Myer, Va. It filters out poison gas, bacteria, radioactive fallout; lets purified air pass through for breathing.



LISTING TO PORT. This 150-foot drydock was too wide to pass through the lock at Bremerhaven, Germany. To squeeze it by, tug crews tilted it 22 degrees by using 15,000 tons of water ballast. It just cleared the wall at one side.



HE slot machines that sell parking time at the curb will be 25 years old this year. The advance guard of 150, nervously installed on Oklahoma City streets in July, 1935, has multiplied into an army of about 2,000,000. Annual production is about 160,000.

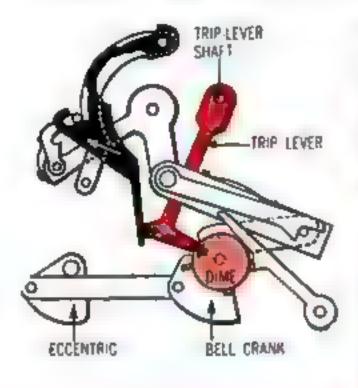
Today's parking meters gulp dimes and quarters as well as the pennies and nickels fed to early ones. They demand a richer diet to handle burgeoning off-street parking lots with higher tariffs for longer hours. One company supplied an airport with machines that run three days and nights before popping up their over-time flags.

Parking meters lead a tough life.

They're buffeted by cold winds, baked in the hot sun, pelted by rain and snow. But nature isn't their worst enemy—people are. Maintenance men often skimp on cleaning and oiling, motorists try to force bogus coins into them or whack them for misbehavior, thieves spare no tortures. Yet the average meter, which costs about \$65 installed, survives for  $7\frac{1}{2}$  years.

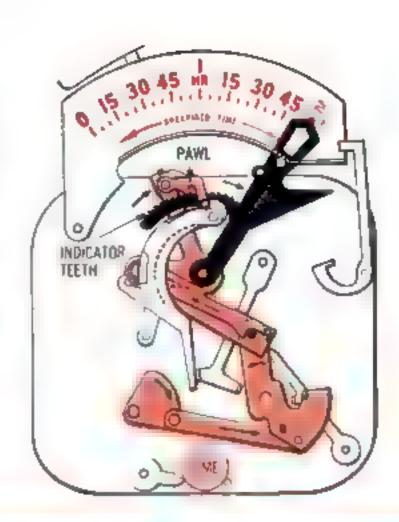
Most of the 3,400 or so U.S. cities that use parking meters bought them on time. The usual arrangement divides meter revenue evenly between the city and the maker until the machine is paid for—about 2½ years in most communities. Once meters are installed they usually stay.—Erik H. Arctander.

### What happens when you feed in a dime

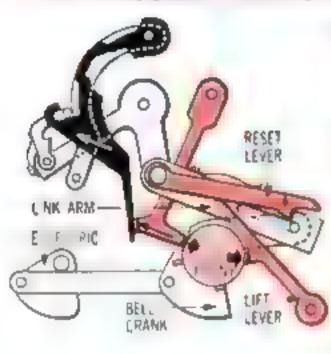


smatter, dime falls neatly into a pocket formed by dogs on reset bell crank. Nudged, sensitive trip lever pivots slightly. Its turning shaft trips clock mechanism, which rotates the time-interval eccentric.

briven by the eccentric, the bell crank shoves the reset link orm. The link arm swings the pawl around. And the pawl, engaged with indicator teeth, pushes the indicator all the way over to give maximum time.

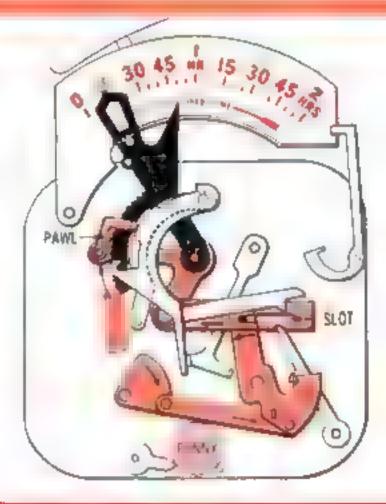


### What happens when you feed in a penny

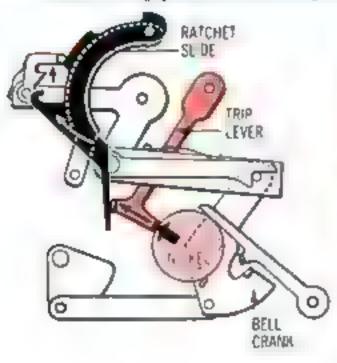


BIGGER than a dime, the penny shoves the lift lever aside as it falls into the coin pocket.

raises reset lever on link arm, uncovering a slot. As eccentric drives bell crank, pin on crank slides in the slot before swinging the pawl. Indicator goes to 12-minute mark because 108 minutes' worth of motion was lost as the pin rode in the slot.

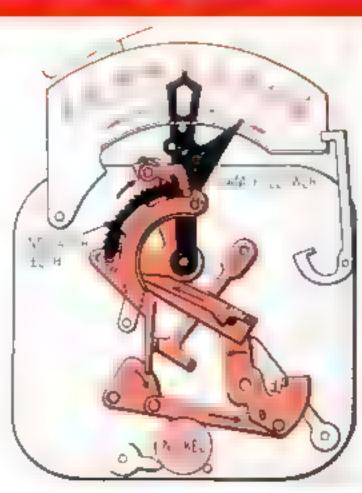


### What happens when you feed in a nickel



atGGEST, nickel can't fit into the pocket. It slides to the left, shouldering uside the trip lever and coming to rest on the bell-crank dog.

SHOVED FAR OVER, trip lever raises the outer, lobed plate of ratchet slide. As pawl carries indicator teeth along, it disengages for an hour's worth of time while the cam follower is riding over the lobe on the ratchet slide,





HOW Y BELTS WORK: In low (top), belts run on small front pulleys, large rear ones. Ratios reverse as speed increases.



WORTH A LOOK no matter which way it's going, Holland's DAF has pertly trim lines that should weather the style years well. Its engine is up front and there's a big trunk in the back.

40 POPULAR SCIENCE DECEMBER 1959



**OPEN FOR INSPECTION**, the variable V-belt drive is shown with the back seat out. The big casings on the front pulleys house the automatic controls; the box between them covers the bevel drive.

### Belt Drive

### By Harry Walton

DAF is different. Inside, it has no clutch pedal and no gearshift. Underneath, there's no differential, no rear axle, no chassis. Flip over a shipload of DAF's and you won't find a single grease fitting.

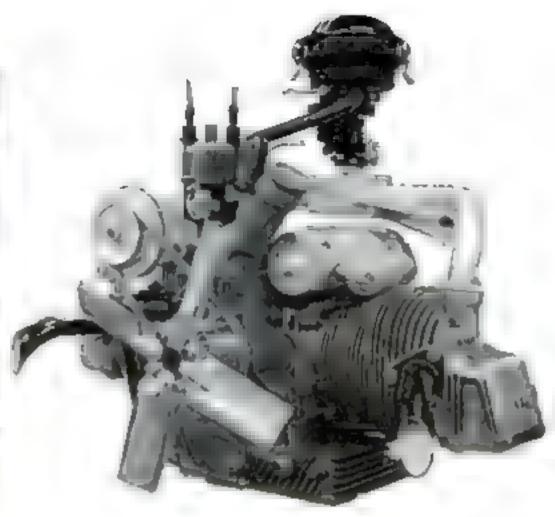
What this slick little bus does have is a number of "firsts," It's the only inexpensive car you need never drive onto a lube rack. It's the first economy car with fully automatic drive—not just an automatic clutch, but a transmission system that shifts for itself. It's the only small car with positive-drive differential action—if one wheel slips on ice or snow, the other pulls you out.

With modest 12-inch wheels, the DAF manages to have seven inches of ground clearance. This makes it as goat-nimble on rough roads as the mourned Model T—but a sight more comfortable. It also has a pertly attractive body, generous window area, and a respectable luggage compartment.

The first Holland-made passenger car in decades, the DAF is built by Van Doorne's Automobielfabriek, of Eindhoven, a factory that built heavy truck



LUBELESS, the car uses oil only for the engine (about two quarts). The flathead twin power plant is air-cooled by a fan mounted behind the grille.



## Shifts Dutch Economy Car

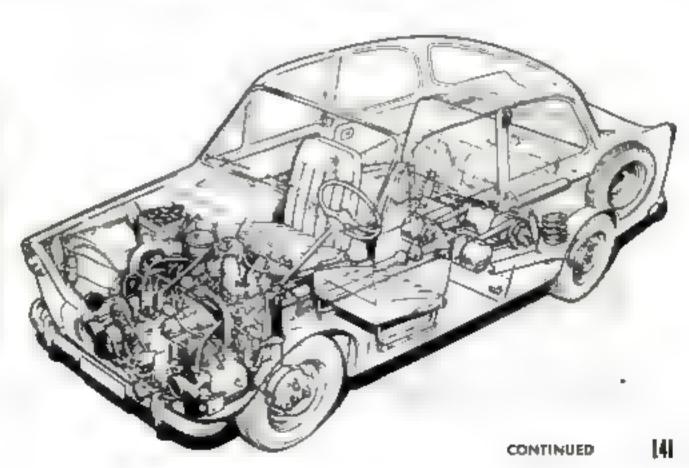
trailers and military vehicles from 1930 to World War II, and now turns out trucks, fire engines, and military vehicles for NATO forces.

The standard DAF is to sell here at under \$1,500, the deluxe version for under \$1,600. Automatic drive is standard in both; the differences add up to two-color bodies, adjustable instead of fixed wind wings, and other interior details.

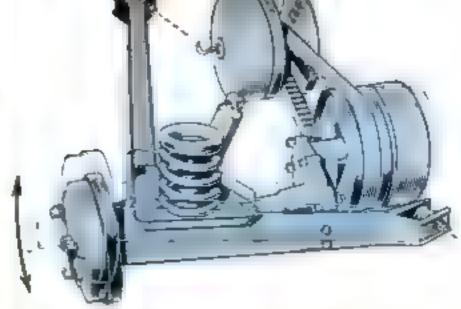
Under the hood. The air-cooled, four-cycle flat twin engine has a 600-c.c. (36-cu.-in.) displacement. Amply oversquare to hold down piston travel (three-in. bore, 2.5-in. stroke), it develops 22 hp. The crankcase, finned for extra cooling, takes only two quarts of oil.

Cast-iron cylinder sleeves have aluminum-finned jackets cast around them. The aluminum heads have cast-iron

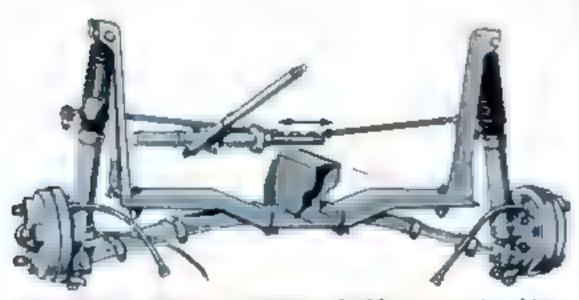
built around a forkshaped box member
(not shown), the stem
of which rests on a
transverse front spring,
the times on rear coil
springs. Insulation and
rubber mountings for
engine and drive are so
effective that, though
the engine noise is loud
outside the car, it is
well muted within.



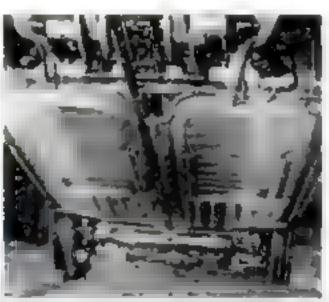




wheels droop as the DAF is raised, as on other swing-axle cars. The half-axles are mounted on angled links with their pivot points in line with the lower, tight sides of the belts. The slack sides give enough to permit up-and-down movement of the wheels (arrows above). On turns, differential action results as each belt shifts to match the speed of its wheel.



TELESCOPING SHOCK ABSORBERS double as steering kingpurs. This is a clever dodge that helps to eliminate several front-end parts on the little Dutch car. The steering gear is the rack-and-pinion type. Wheels are small—12 inches.



flat UNDERPAN encloses the body forward. This is part of the streamlining designed to make DAF as immune to crosswinds as possible.

valve-seat inserts (the exhaust valves are cannily set forward to get first crack at the cooling air). Only two cams on the camshaft work the four overhead valves.

That automatic drive starts with a centrifugal clutch built into the engine flywheel. A short shaft carries power to a right-angle bevel drive just under the

rear seat. The output shaft on each side of the gearbox carries a wide V pulley with a sliding flange. A cogged V belt links each pulley with one on the inboard end of each swing axle.

As engine revs and manifold vacuum increase, centrifugal weights and a vacuum unit in each driving pulley pinch its sliding flange over, forcing the belt onto a larger diameter. Spring-loaded flanges on the driven pulleys give way, letting the belt drop to a smaller diameter. The overall ratio varies in a stepless range from 20:1 on starting to 4.4:1 in high.

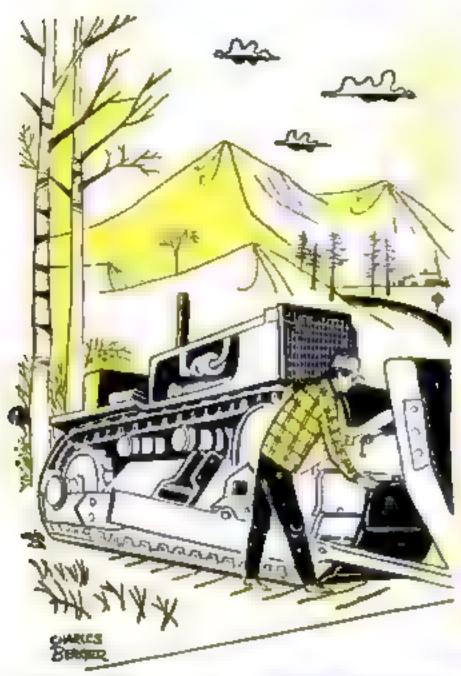
Each half-axle, mounted on a triangulated link with its pivots in line with the tight or driving side of the belt, can move up and down freely without affecting power transmission. A sealed gearbox on the axle end provides the rest of



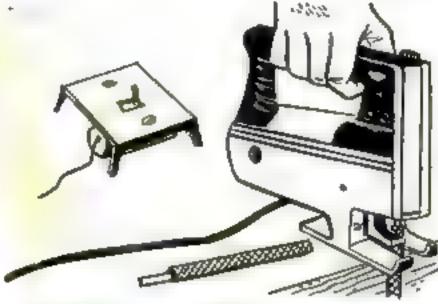
TAKING UP BELT SLACK, though rarely necessary, is easy. It's done by turning a shaft with the lug wrench. A dash indicator goes out when the belts have reached proper tension.

[Continued on page 226]

### "I'd like to see them make..."



RUBBER TREAD COVERS for tracked equipment. Then you could drive a rig short distances on roads instead of hauling it to conform to state laws.—B. R. Sealey Ir., Warnetck, Va.



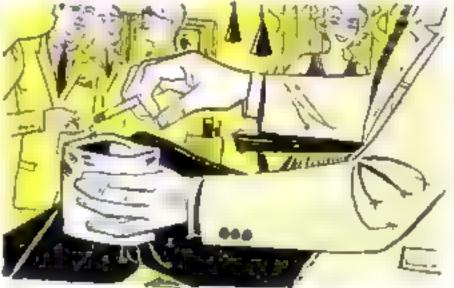
DUAL-USE SABER SAWS of the hand type that come with a table for bench use. They'd have detachable mounts for round-shank files and sanding strips.—A. C. Craft, Santa Ana, Cal.



**DETWEEN-STUDS MOSE REELS** at all outside faucets. With both outside and indoor openings, the bose could be used for garden or firefighting.—C. J. Scott, Jersey City, N. J.



A TWO-SETTING CAR THERMOSTAT for quick heat in winter, normal in summer. You'd adjust a setscrew mounted in a water-tight bushing in the housing.—W. M. Handley, Mentor, Ohio.



FOIL POCKET LINERS to keep coat pockets free of tobacco shreds and lint. They could be lifted out to serve as disposable ash trays, too.—C. J. Berger, Plaintiew, N. Y.

Everyone has his own pet idea of a gadget that he would like to see in general use. The five ideas illustrated above were suggested by Postlan Scinen readers. What's

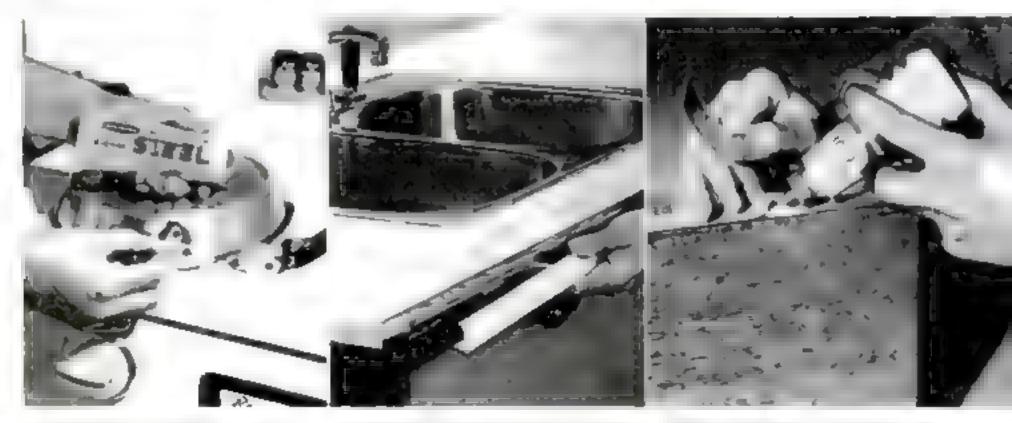
yours? We will pay \$5 for each one published. Please use Concrement postcards only Write name and address electly Contributions cannot be acknowledged of returned.

### WHAT'S NEW.....



NAVY FROGMAN is assembled to scale from a 31-piece plastic hobby kit. It's attached here to a hose from an air

pump used for aerating a tropical-fish tank. Price, \$1. Precision Plastics Co., 4647 Stenton Ave., Philadelphia.



LIQUID STEEL in a tube needs no mixing. It adheres to all metals, bonds them to concrete, fiberglass, or wood. You can file, sand, or machine the patch; burnish it to copper, brass, or silver color. \$1. Woodhill Chemical Co., 1390 E. 34th St., Cleveland.

counter edging has a plastic facing on an aluminum base. It comes in colors to match all plastic-laminate counter tops, Kalwood molding is available in eight-foot lengths which you cut to size, press into place. Keller Products, Inc., Manchester, N.H.

penses Presto-Set glue like oil from a can, in drops or a stream. Two spatulas—one for spreading, the other for fine work—are attached to the cap. You can use empty tubes as sprayers, 39 and 59 cents. U.S. Plywood Corp., 55 W. 44th St., NYC.

44 POPULAR SCIENCE DECEMBER 1959

### Toolbox Opens into a Bench

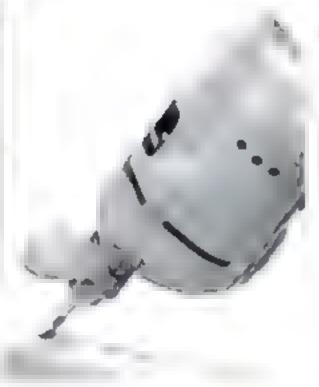
Place this toolbox on sawhorses or a table when you get to a job, and you have a handy workbench. The handle of its built-in wood vise serves as a carrier when locked in a ring.

The box is maple, has an inch-thick working surface. It comes with an extra blank for cutting a rack to fit your own tools. There's room under the bench top for hand power tools. Between \$30 and \$40. Custom Products Co., 143-36 229th St., Springfield Gardens, N.Y.









FM TUNER cuts out interference from bridges, power lines, medium-length tunnels. It converts your car radio to FM reception on 88 to 108 megacycles. One lead hooks on the antenna jack, the other to any 12-volt source. Gonset, 801 S. Main St., Burbank, Cal.

makes an appearance for style-conscious householders. Called the "Celeste," its 75 watts spread diffused pink or white light. The bulb is said to burn three to five years in ordinary use, is expected to sell for \$2.49 General Electric, Cleveland.

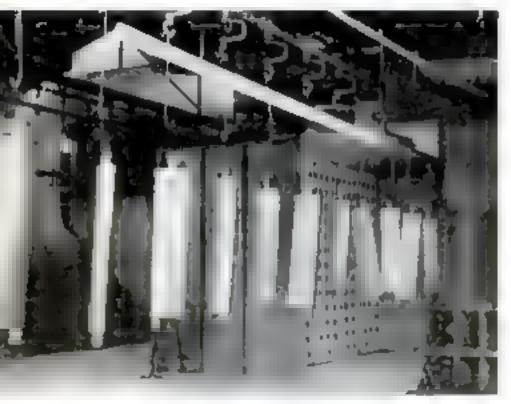
captured bubble that lets you drill holes at an angle without use of a jig. It bolts onto the drill, has vertical and 45-degree readings. Tru-Hole level sells for 98 cents. Oliver & Long Development Co., 451 South First St., San Jose, Cal.

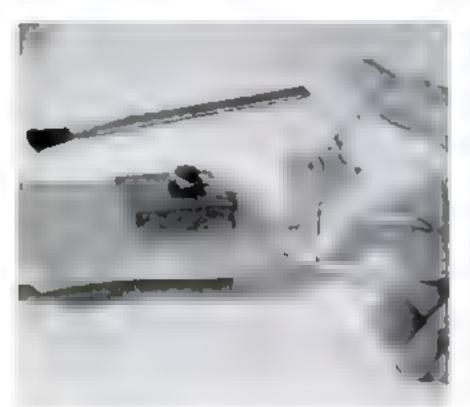




### Do-It-Yourself Cement Mixer

With this little machine, you can mix a 50-pound batch of cement in two minutes without help. The pail turns on a sprocket-rimmed base driven by chain from a flywheel. This is belt-connected to a mounted motor. A fixed paddle mixes the contents. Price, \$29.95 without motor. Kol, Inc., 2323 Ellis Ave., St. Paul, Minn.





"LIFETIME" MUFFLER has a thin refractory-ceramic coating fused to the metal inside and out to resist corrosion, shock, and heat of 1,500 degrees. It's guaranteed for 100,000 miles, the average 11-year life of most cars. The mufflers above are shown on a trolley line ready for admission to the firing chamber. Bettinger Corp., Milford, Mass.

ONE-HAND CLAMP for light jobs works with spring action. It has rubber-padded arms that grip work from \( \frac{1}{10} \) to \( 1\frac{1}{10} \) inches thick. You turn a six-lobed cam with one finger to close the clamp down to size and apply pressure. Called Klip Klamp, it sells for 50 cents. Wedge-lock Corp., 11323 Hartland Ave., North Hollywood, Cal.





TAP AND DIE HOLDERS store five sizes each—1/4 to 1/2 inch—in their handles. This arrangement lets you keep them protected and in one place in your toolbox, and permits a quick, easy change

in sizes. Both are precision made of alloy steel. The wrench is priced at \$5.25 in plain finish, \$6 chrome; dies and stock, \$4.95 plain, \$5.70 chrome. Threadit Tap & Die Division, Lyndonville, Vt.



DISAPPEARING RANGE swings up on hinges against the counter-top electric oven when not in use to add working space to a small kitchen. The 32-inch-wide oven has a built-in rotisserie. With a year and a half of market testing behind it, the unit will go into production next month. Price, \$450. Hotpoint, 5600 W. Taylor St., Chicago.



TAPE SEALANT repairs wornout threads on leaky faucets, shower
heads, or automatic-washer hoses. It's
made of Du Pont Teflon, a resin plastic.
After replacing the washer or packing if
necessary, you wrap one thickness around
the threads, then screw into place. The
tape conforms, acts like pipe compound
Permacel, New Brunswick, N.J

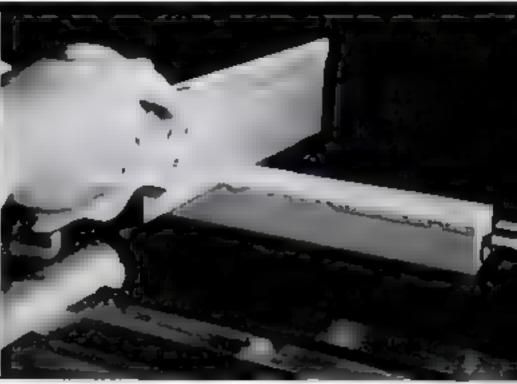




Here's a good elementary lesson in wood-lathe operation-



CUT THE DAMAGED BALUSTER IN HALF, lengthwise. Tape onto one of the halves any broken pieces necessary to restore original proble of baluster Mark profile on lathe-mounted stock.



cut to the full depth of each design feature with a fine-toothed saw, making kerfs on outer sides of beads and other raised elements, as above. Cuts serve as safety markers in turning.

MECHANICS AND HANDICRAFT

High time, these lovers of woodworking say, to blow the dust off that wonderful tool, the wood lathe

# The Toolean Power Tool

By R. J. De Cristoforo and Henry B. Comstock

NCE a wood lathe was the only power tool the average craftsman owned. The reason was plain. With a bit of beef you could handle every woodworking chore but one with hand tools. The exception was forming circular and spindle-shaped parts. There a lathe was a must.

Times changed. Ornate turnings went out with the wasp waist, and lathes were often forgotten as other motor-driven rigs made routine shopwork easier.

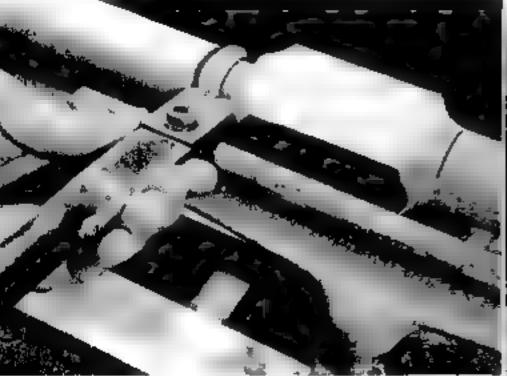
Now the pendulum is swinging back. Tasteful, gently curved furniture is on the upswing. With it, the lathe is staging a comeback. That's good. For as any old-ster can tell you, it's the most enjoyable power tool you can own.

The fun starts the first time you place a chunk of wood between the centers of one of these wonderfully cooperative machines and ease into the whirling stock with a %-inch gouge.

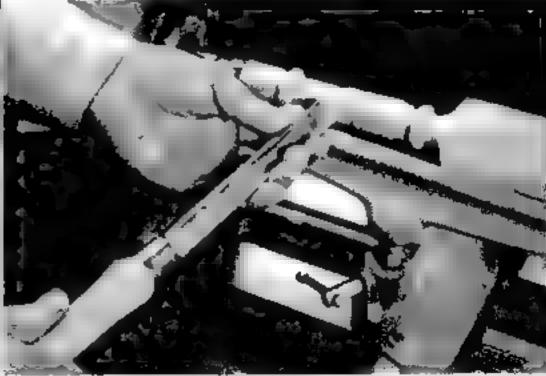
As you stroke along the toolrest, the coarse chips and chatter of the roughing cut turn quickly to a flurry of fine dust and a contented purr. You've worked your first lathe magic. You've converted raw material—even a bit of firewood, perhaps—into a cylindrical form.

Your confidence grows. You switch to a square-nose chisel and level off the little hills and valleys. Next, you angle the chisel 45 degrees and bring one corner of the cutting edge lightly against the wood. Instantly an unwavering line girdles it. You deepen the line to form a V groove, then discover you can make a cove the same way with the gouge. Convex curves? You are the square-nose

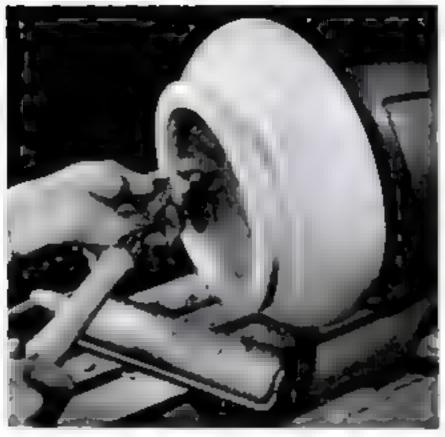
### duplicating a broken stair baluster



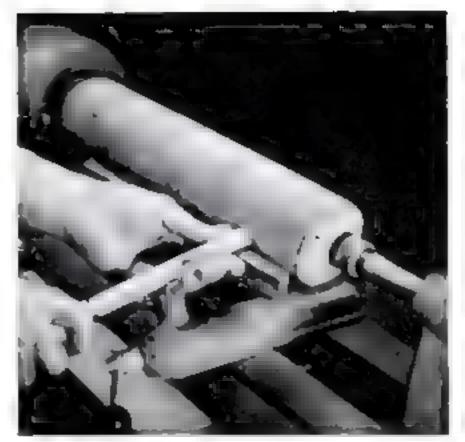
FORM THE DESIGN ELEMENTS to full depth. Here, a homemade tool designed to hold standard molding knives speeds the work. But you could also form the beads with a skew chisel.



CLEAN OUT STOCK between designs. Holding a gouge tilted makes for faster cutting. After straightaways are formed, the new spindle is ready for the final step—sanding.



WORK TO THE LEFT OF CENTER when making end and internal cuts with the stock mounted on a faceplate. The toolrest is set at right angles to the lathe bed to support the chisel.



convert turnings to ovals by remounting the work on two matching offcenter points. In the photo above, wood is being removed from the side opposite the first offcenter points.

chisel on the toolrest, holding it flat for large-radius curves, and with the blade tilted nearly vertical for close-spaced beads.

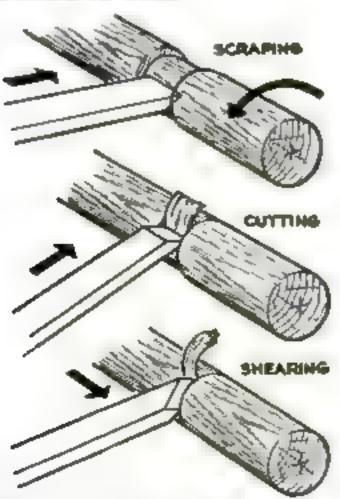
Tentatively you try a taper. This time you use a chisel with a diagonal cutting edge, called a skew. Placing the blade upright, you start the cut with its heel and work gradually toward the point as you draw the skew along the toolrest.

You're becoming an expert. Within an hour you've mastered enough shaping

tricks to start blending them into designs of your own. That's one of the excitements of this power rig. There's no need to rely on fixed patterns as you do when running wood through a shaper or over a molding head.

You're also ready to apply your skill to two out of three practical lathe jobs: making contemporary or period-furniture parts, a replacement for a broken baluster or lawn-mower roller, wheels for toys, a set of chessmen. But you still haven't

#### THREE WAYS TO TURN

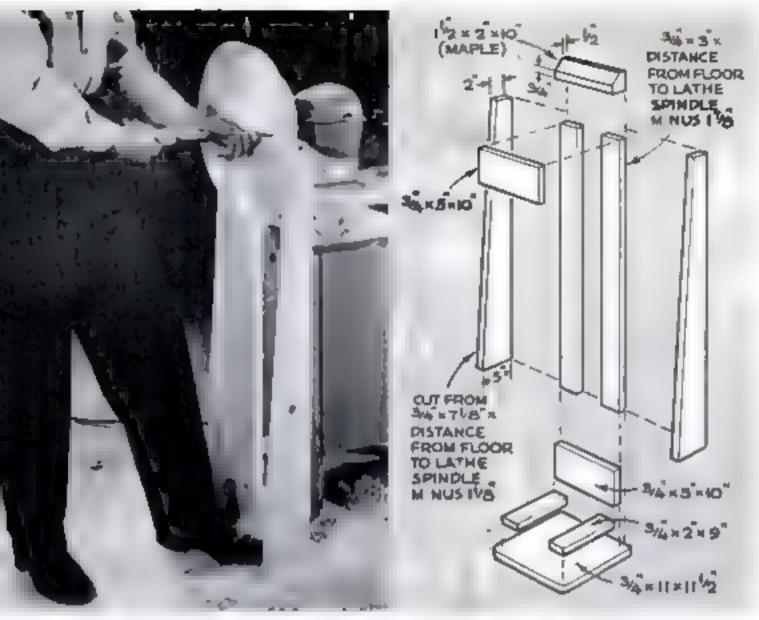


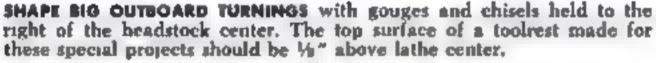
150 POPULAR SCIENCE DECEMBER 1959

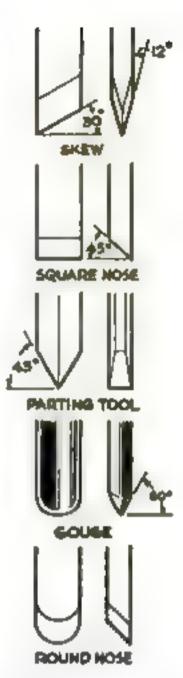
### Two handy uses for an index head—



LATHE WITH AN INDEX HEAD (note the pin-andpulley locking arrangement) holds turnings in any position for fluting and reeding. With a simple pig you can use a router for this job.





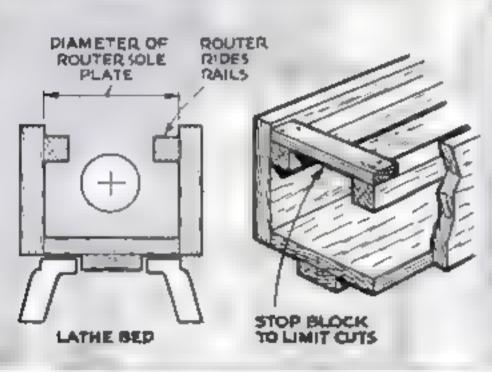


LATHE CHISELS

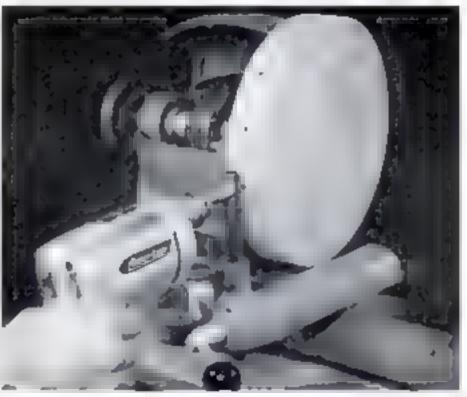
begun to explore the more sophisticated talents of the lathe. Here's what's ahead:

Faceplate turning. Let's say you want to shape one of those gracefully shallow, natural-wood-finished bowls that are popular today. You can't mount the work stock in the usual way because the spur center on the driven, or live spindle doesn't offer enough grip for so large a turning. Besides, the other, or dead center, would interfere with the bowl-hollowing cut.

### reeding, and spotting radial holes



ROUTER JIG IS A TROUGH assembled from plywood and strips of scrap lumber. Clamped to the lathe bed, it provides a simple-to-use track and depth-control guide for the tool.



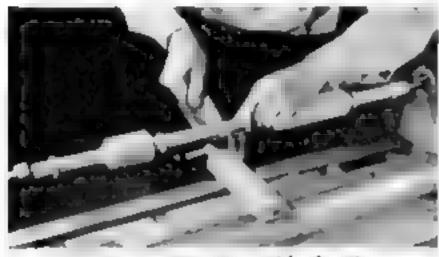
DRILLING RADIAL HOLES, accurately spaced, is another index-head specialty. The bushing that aligns the drill bit is press-fitted in a tube clamped to the toolrest support.

The answer to your problem is a disk-shaped lathe attachment called a face-plate. You simply fasten the work to the disk with screws and thread the faceplate to the lathe's live spindle. This gives the wood a firm, true-running support for both outside and inside cuts. When the job is done, you back out the screws and

### Sanding and finishing are done right on the lathe



SANDPAPER BACKED WITH A SCRAP BOARD makes short work of smoothing cylindrical surfaces and tapers. Turn the board at right angles to the lathe when sanding quarter-rounds.



DO "SHOESHINE" SANDING with abrasive paper or cloth passed under the work and drawn up lightly on both sides. This way you can see and better control the smoothing action.



A SUFFING MACHINE, TOO, the lathe that shaped the project now gives it a satin or mirror-bright finish. All you do is apply the material; fast spinning supplies the necessary muscle.

fill the holes in the bottom of the bowl with wood putty, using glue and sawdust garnered from the turning.

After a couple of faceplate operations you'll almost certainly want to create a showpiece with a base so thin that mounting acrews would interfere with inside cutting. Here's a way to sidestep that trouble:

Screw a piece of scrap wood to the faceplate. Turn it to the same diameter and glue a piece of newspaper to its outer face. Jigsaw the work stock roughly to outside contour and glue it to the paper. Turn the bowl after the joint has set. Then part it from its backing by slicing through the paper with a knufe.

Outboard turning. Thinking big? Perhaps in terms of a tray or a wheel that won't clear the lathe bed? If your machine has a spindle projection on the outboard side of its headstock you're in business. Just attach a faceplate to this end of the spindle, improvise a toolrest, and use a low turning speed.

Turning ovals. Here's another fun operation. You start by running off a cylinder with a diameter slightly larger than the maximum dimension of the elipse. Then you re-turn the work on two other pairs of centers, one on either side of the first. In both cases, cut into the eccentrically placed stock just far enough to feather in and out of the wood at opposite sides of the original turning. The result is a spindle with a cross section that resembles a football.

To round off the sharp ridges where the two arced surfaces meet, remount the work on the first pair of centers, wrap a strip of sandpaper over the wood and run the lathe at low speed until you get smooth connecting curves.

Index-head work. Putting evenly spaced flutes and reeds in turned furniture legs is a pushover. All you need is a lathe with an index head. This takes the form of a series of holes bored in one end of the headstock pulley, and a locking pin. You rotate the work to be fluted to any desired position and snap the pin into one of the holes. Then with a shaper cutter arbored on a flexible shaft, you form a groove, using the toolrest as a steady. You repeat this routine as often as necessary to form the desired number of ridges and hollows around the spindle.

[Continued on page 240]





### Disk Sanding on a Lathe

A PLATFORM made of plywood and lumber converts a wood-turning lathe into a valuable disk sander. Bolt the platform to the lathe bed. A groove in the table allows use of a bench-saw miter gauge.—R. J. Cristoforo, Los Altos Hills, Cal.

#### Bench Measure from Old Tape

Two or three feet cut from a discarded steel tape make a handy shop measure. Punch small holes in the tape and tack it to the bench edge, near the vise. You'll never again have to hunt for a rule or a yard-stick when cutting small pieces to length.—Henry Walters, White Plains, N. Y.



### WHAT'S YOUR MECHANICAL IQ?

### The Case of the Two-Piece Pump

WANT a positive-displacement oil pump with just two moving parts," said the Chief Engineer. "You can drive it off a stud on the cam gear of the engine, so don't worry about a shaft or crank. But it shouldn't have valves, a con rod, a wrist pin or any other small fast-wearing parts."

"An oil pump with only two moving parts?" echoed the assistant design engineer. "You mean a gear pump?"

"No!" barked the C.E. "I mean a piston pump that will deliver oil under pressure whether it's running 500 or 1,500 strokes a minute. And it's to have exactly two rugged, good-sized, cheaply made parts."

"Yes sir," said his assistant dubiously.
"I'll try."



Can it be done? Exactly such a pump was recently designed for a popular four-cycle mower engine. A hint: valving is achieved through ports in the crankpin. Can you figure how it was done? The answer is on page 156.

# A Rose Engine with a New Twist

### By Harry Walton

OLOR has now been added to the rose engine, a drafting device once used to embellish folding money, stock certificates and jewelry. The color comes from colored ballpoint pens. Turn the handle, and the machine automatically draws crisp-lined, intricate, colored patterns as fast as the wheels go round. Shift the settings and you create designs of endless variety.

Easily made in a home shop, this new version of the old machine will provide hours of fun for children. Adults can adapt the drawings for decorating tiles or hand-painted furniture, original em-

broidery or enamel work.

How to make it. First cut two disks from %" plywood. Drill and countersink a center hole in each. Then turn a shallow V groove in the edge. This is a lathe job, but it can be done with an electric drill or a drill press by mounting the disks on a buffing-pad arbor. Make sure they spin true; then use a small, sharp chisel to turn the groove.

Make the crank head from 2" hardwood, part of a rolling pin, or a wooden top as in the photo below. Turn two grooves close together. Drill 33" holes along a spiral in the flat head.

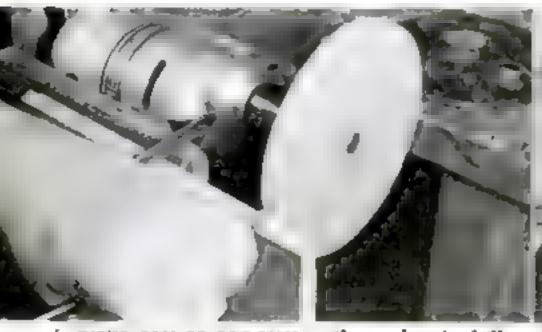
Loop a thin, strong cord around the two disks and crank head, tying it short enough to pull the arm in against its rubber-band tension. Drill the pen block for a close push fit on the wire arm. Drill a No. 7 hole crosswise of the pen socket and turn in a ½"-20 lock bolt. Make the pen rest of thin metal, drill several 7/64" holes, and mount it in a grooved block screwed to the base from beneath.

How to use it. Fasten a paper disk on the big wheel with map pins. Slide the pen arm into a hole in the rest and drop the hooked end into a hole in the crank head. If the pen fails to draw clearly,

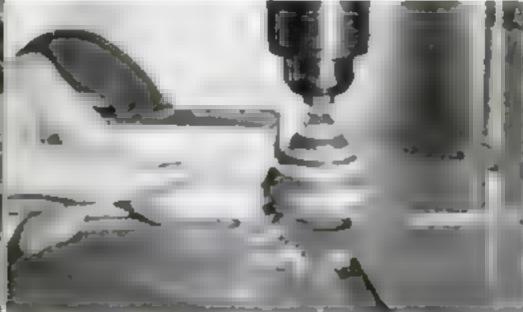
weight it with big washers.

To change patterns, you can shift the pen arm into other holes in the rest or crank head, or slide the pen block to different positions on its arm. A different kind of action results from looping the cord around the crank head to drive it in reverse.

If the pen follows the same line after one revolution, try the other groove in the crank head, or turn the first one slightly smaller to alter the ratio between it and the big disk.

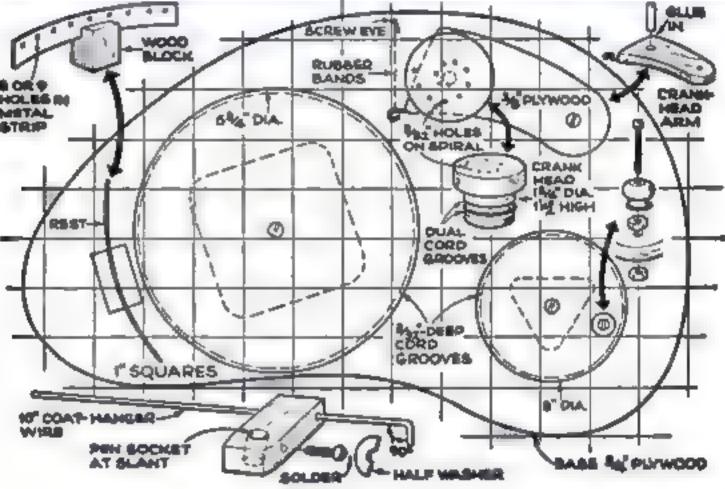


DISKS CAN BE GROOVED with an electric drill. Remove the pad of a buffing arbor, put the screw through the disk and tighten it into the chucked arbor body. A piece of plywood clamped to the vise forms a convenient toolrest.



CRANK HEAD can be made from a wooden top. Saw through at its largest diameter, remove point and bore 5 16". Twist onto a tight-fitting dowel, chuck, and turn grooves. Then sand the dowel until the head can turn on it.

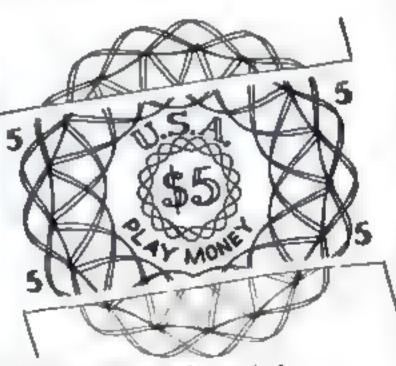




You crank
the handle
and color
ballpoint
pens draw
fancy designs
in this odd
machine

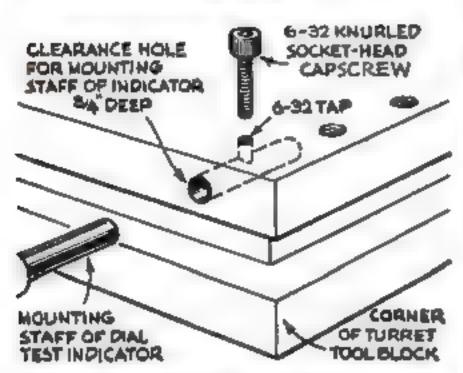


READY FOR USE: Big disk pivots directly on %"-thick plywood nailed to base. Lubricate these and other wooden parts with oil and graphite, tightening screws just short of binding. The crankhead arm must pivot freely. Black pin in the arm is a graphited dowel on which the crank head turns.



PLAY MONEY can be made by cutting rectangles from the disks. To draw lines of a different color, switch to another pen. They come in many colors.





#### Mount for Dial Test Indicator

WITH this mounting, you can use a dial test indicator to center work in a four-jaw chuck without having to dismount the turret tool holder or resort to awkward clamps. Drill a clearance hole in the tool block and cross-drill into this hole from above. Tap it for a No. 6-32 socket-head capscrew. With only finger tightening, the screw will grip the mounting staff of the dial indicator firmly, to permit easy attachment.—Joseph Whitehill, Easton, Md.



Fire-Safe Bucket for Storage

INPLAMMABLE waste or liquids can be stored safely if they're placed in an old five-gallon paint container with a special hinged lid. Part of the lid is cut off and permanently fastened to the bucket rim. The remaining portion is hinged to this piece. A triangular metal or wood block is bolted to the hinged lid to keep it from being fully opened. The lid will fall shut when released.—Glen F. Stillwell, Manhattan Beach, Cal.

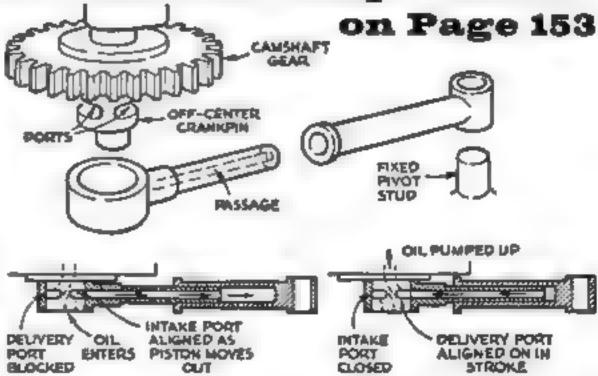
Answer to Two-Piece Oil-Pump Problem

THE oil pump in one small vertical-shaft engine consists of a pump barrel closed at the top and pivoting on an eye at that end. The piston and con rod are one piece, with a passage drilled through to the bearing end.

The crankpin on the camshaft has two slots or ports, one opening to the bottom and the other connecting to a passage through the shaft by which oil can reach other

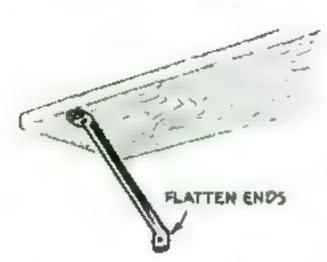
Parts of the engine when under pressure.

As the crankpin draws the piston out, the intake port sweeps before the piston passage and oil is drawn into the cylinder.



On the in stroke of the piston, oil is forced out of the cylinder and through the piston passage to the delivery port. The entire pump assembly operates in oil.

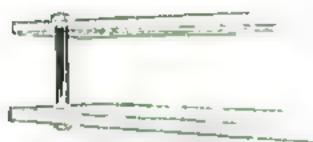
# Where to Use Scraps of Metal Tubing



HOSE MENDER



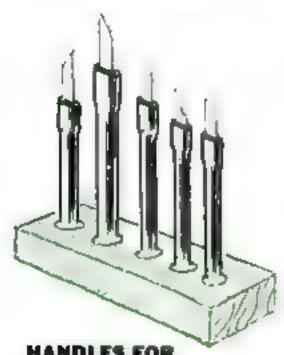
SHELF BRACKET



GUIDES FOR CONTROL CABLES



SHELF SPACER



ERASERS

HANDLES FOR SPECIAL KNIVES



**GRASS SHEARS** 

Meredalle de la company

REPLACEMENT

HANDLE

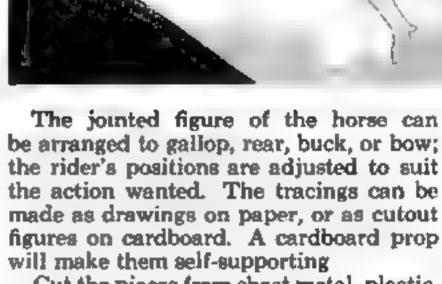
SLEEVE IN MASONRY WALLS

Every youngster can become a Western artist just by—

# a Bronco a Bronco and Cowpoke

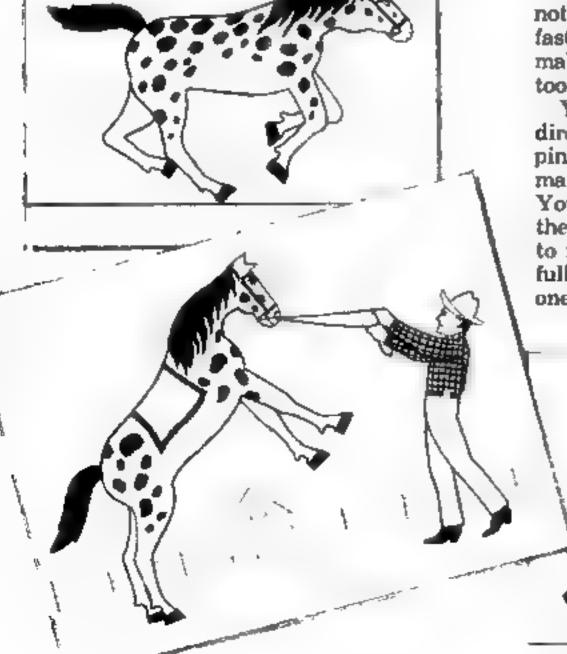
By Hi Sibley

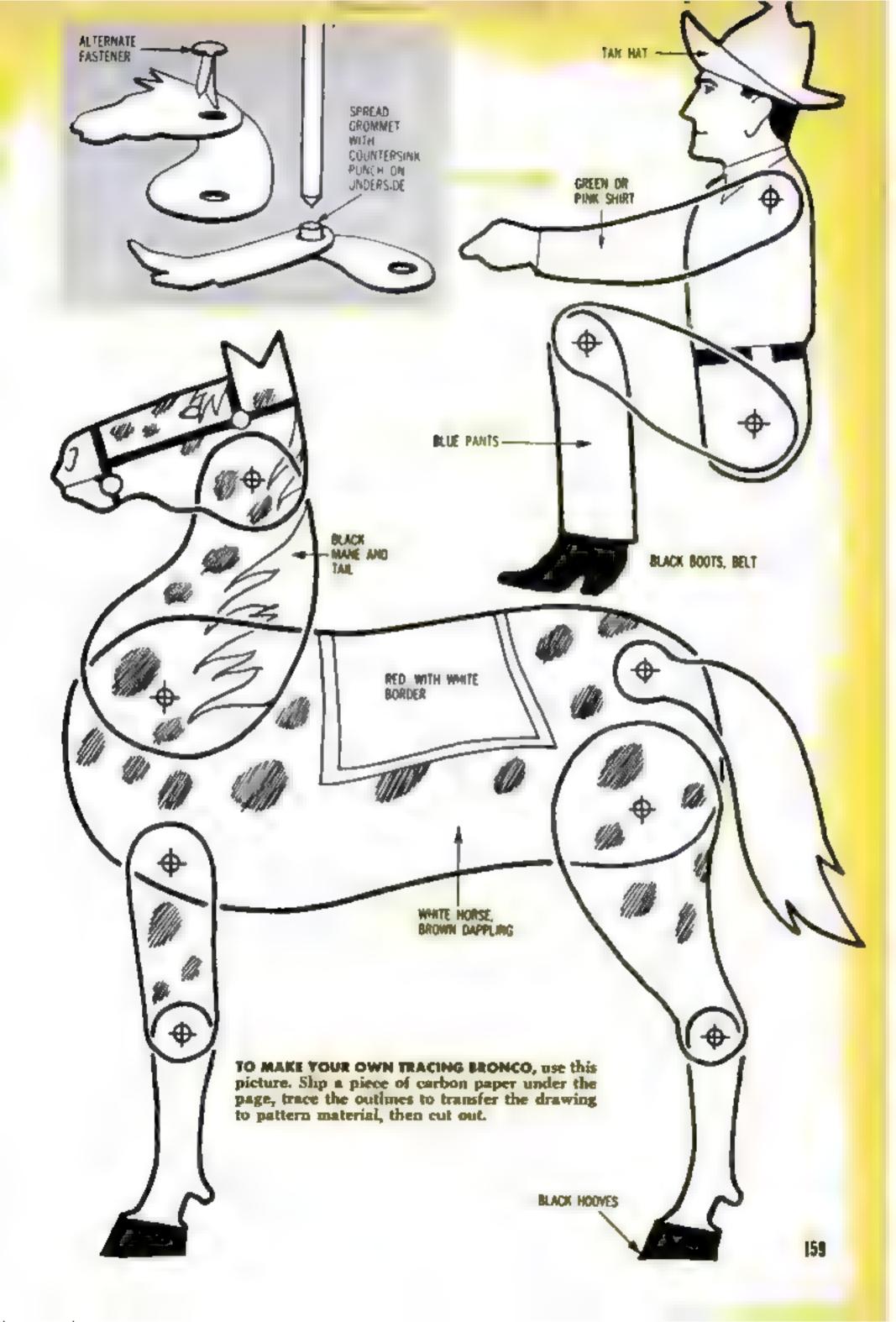
rein to a kid's artistic talent. He can trace around them to produce a corral full of horses and cowpokes.



Cut the pieces from sheet metal, plastic, or Bristol board. Assemble them with notions-counter eyelets or brass paper-fasteners. If you use eyelets—and they make the neatest joints—don't set them too tightly.

You can transfer the parts drawings directly to the pattern material by slipping a sheet of carbon paper under the magazine page and tracing the outlines. You'll notice the horse has but two legs, the cowboy only one. These can be moved to new positions and traced to make the full complement. Or you can add extra ones to the patterns.







#### Decorating with Homemade Snow

ARTIFICIAL snow that costs only pennies to make, yet is superior to many commercial varieties, can be made from soap powder. Fill a large mixing bowl 2/3 full of the powder—preferably a

nondetergent type—and add a cup of water. Whip with an electric mixer. The thick, fluffy "snow" that results can be

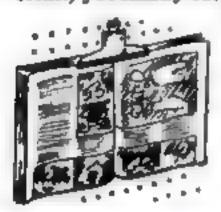


applied with a broad knife. The snow will dry to adhere well and last for weeks.

-Kenneth A. Enochs, Glendale, Cal.

# **Holding Reference Pages**

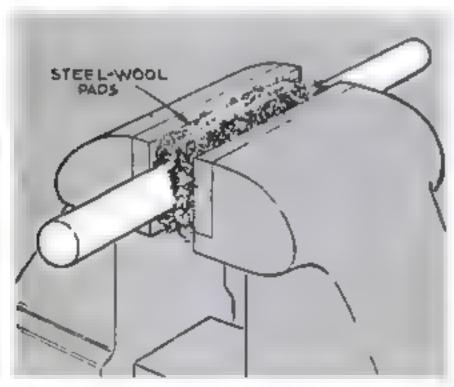
To keep your copy of Popular Science clean, yet handy for reference in the shop.



try this: Mount the spring clip from a clipboard at eye level on the wall or tool panel over the bench or other work area.

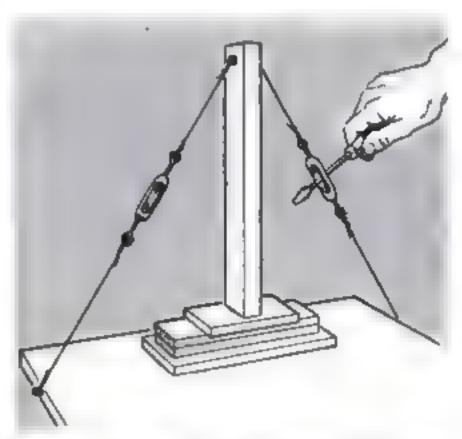
—Joseph D. Campbell, East Alton, Ill.

DEPTH AND A SOLUTION OF ABOUT ONE OPERATION WITH A SOLUTION OF ABOUT ONE PART LIGHT OF A SOLUTION OF ABOUT ONE PART LIGHT OF A SOLUTION OF ABOUT OF



# **Gripping Round Shapes in Vise**

Even if your vise has no pipe jaws, you can use it to hold pipe or tubing. Place the round part between two pads of steel wool before clamping it in place. You then can put considerable pressure on the round shape without fear of distortion or slipping. Coarse steel wool works best.—Kendall A. Ennis, Los Angeles.



# **Turnbuckles Make Handy Press**

Two turnbuckles and some heavy wire can be rigged to apply firm pressure where ordinary clamps can't reach. Fasten the wire to the work surface and to a short two-by-four with screw eyes, and tighten the turnbuckles to pull the upright two-by-four down against the work.—James A. Lockhart, Bryan, O.

# The Power-Tool Arc of Safety

# By R. J. De Cristoforo

OME time ago as I watched an expert craftsman demonstrate a new table saw, I noticed that his hands seemed to do a ballet as they moved over the tool. Each hand movement was exaggerated. Even when the blade was idle and he had to move his hand from miter gauge to rip-fence control, the hand

arched high over the blade.

He wasn't striving for effect. He just didn't want to get near that blade. He sincerely believed that if he demonstrated that way, without making a big verbal point of it, he would be emulated—and would have got across his lesson on shop safety.

He has, too. Ever since that day I've copied his hand movements. There are many times when you must move your hands around a table when the cutting tool is still turning. Exaggerating the hand orbit should be elemented.

tary shop practice—one that carries over when the tool isn't turning.

Shooting arrows with a saw. Another demonstrator had a flashy stunt to attract crowds. He bound slim pieces of wood between his saw blade and fence, then propelled them at a bull's-eye behind the saw. A specially prepared piece of stock with a double bevel at one end was sliced apart to make the arrows. These pointed alivers flew back at great speed, and many stuck in the target.

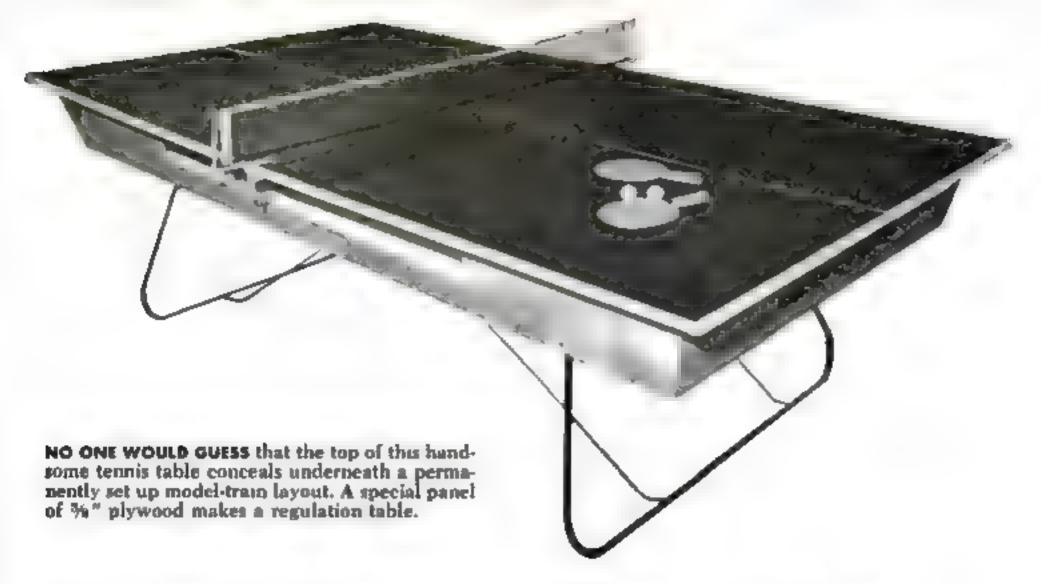
I've never seen a more graphic demonstration of the reason for the old rule; Never stand behind the blade. Rotating at terrific peripheral speed, the blade can throw things back violently from either side. The same action is present on a jointer, drill press, or shaper.

Fear that tool. The dangerous cutting edge is completely disinterested in what's placed before it. A realization of this should evoke a degree of respect far beyond casual observance of safety rules. It precludes the occupational hazard of



becoming contemptuous through familiarity. Few beginners are hurt. The fellows who lack digits used to be beginners. Paradoxically, they entered the zone of greatest danger when their movements became mechanical, their thoughts estranged from the job on hand.

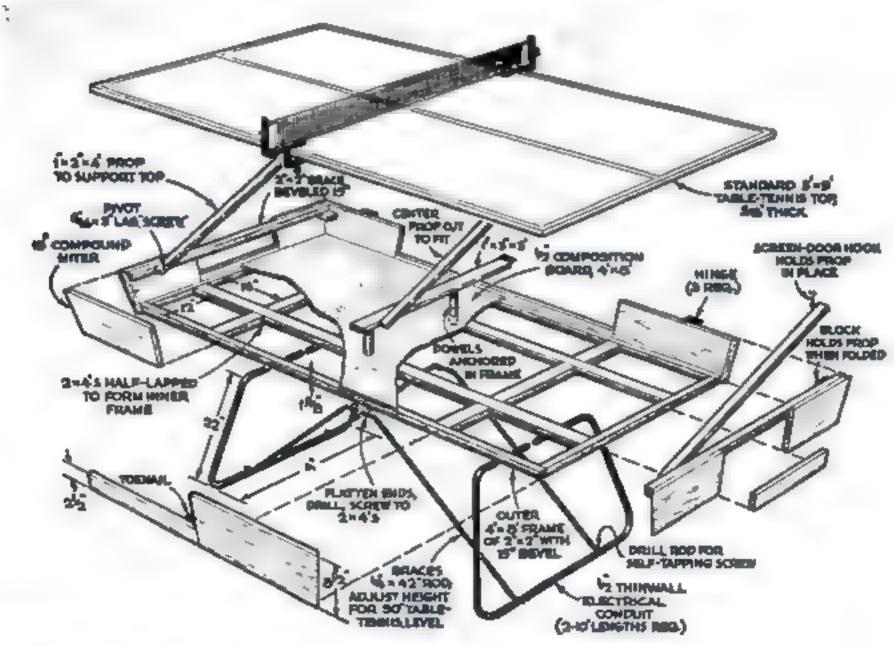
Nobody with a healthy fear of a saw blade would dare put his finger within four inches of it. Fear is a natural instinct. Nature, aware that we'd all be dead quick if not respectful of danger, provided fear to make us stop, make us think, make us cautious. Don't be afraid to be intelligently fearful.

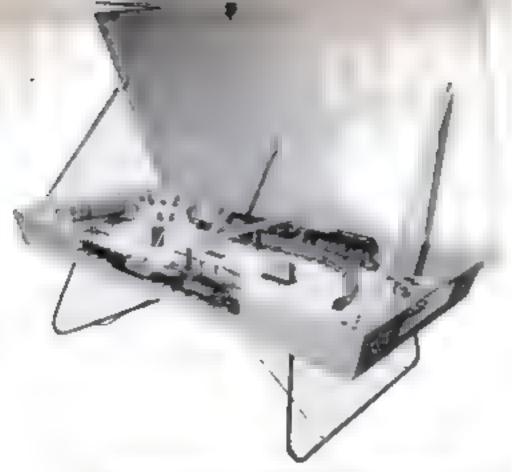


# Trains or Tennis...

# By Joseph C. Gonzales

FORTY-FIVE square feet of floor space do the work of 90 when occupied by this double-purpose table. When there's no one for tennia, the top can be raised on hinges to expose a 4'-by-8' model-train layout framed in a shadow box. The box is deep enough to house scenery and model structures, too.





PIVOTED PROPS hold the table top safely in the raised position. A hook-and-eye on each prop keeps it from slapping. Tracks are fastened to a 4'-by-8' panel of composition board.

# Anyone?

The top of the table is a 5'-by-9' sheet of \%"-thick plywood sold especially for making regulation-size table-tennis boards. Sturdy yet graceful legs of \frac{1}{2}" electrical conduit provide rigid support.



**EACKSONE OF THE TABLE** is a base of half-lapped two-by-fours. Sides of the frame shown are beveled 15 degrees. A straight-sided frame is simpler, looks almost as well. Pipe clamps are used to fasten conduit legs to have.



# **Cotton Swabs for Decorating**

CHRISTMAS ornaments are easy to repaint if you use swab sticks as brushes. The swabs are inexpensive—one can be used for each color and thrown away when the job is done. The soft tip works as well as a tiny paintbrush.

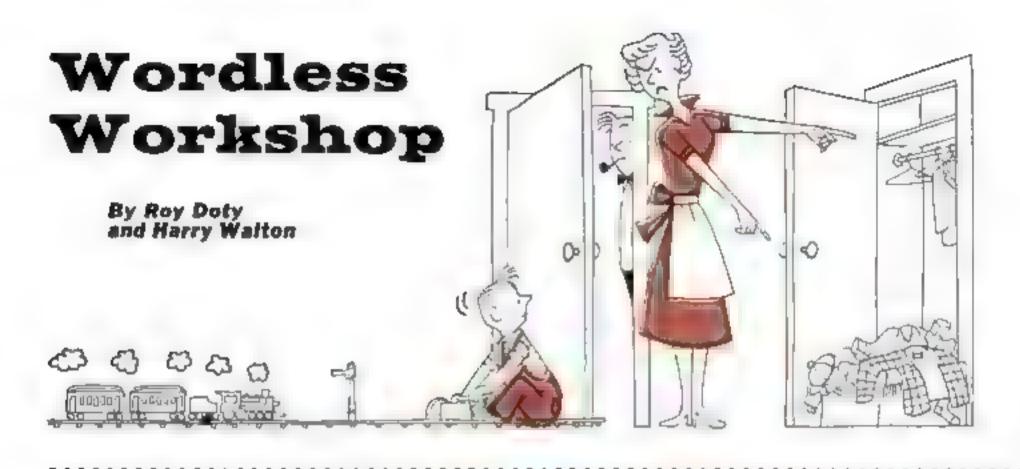
A PRINTER's line gauge is useful for drawing scale plans. The pica scale divides inches into twelfths, or halfpicas, so drawings where 1" equals 1' can be calculated easily and accurately. Other measurements on different line gauges are equally helpful.—

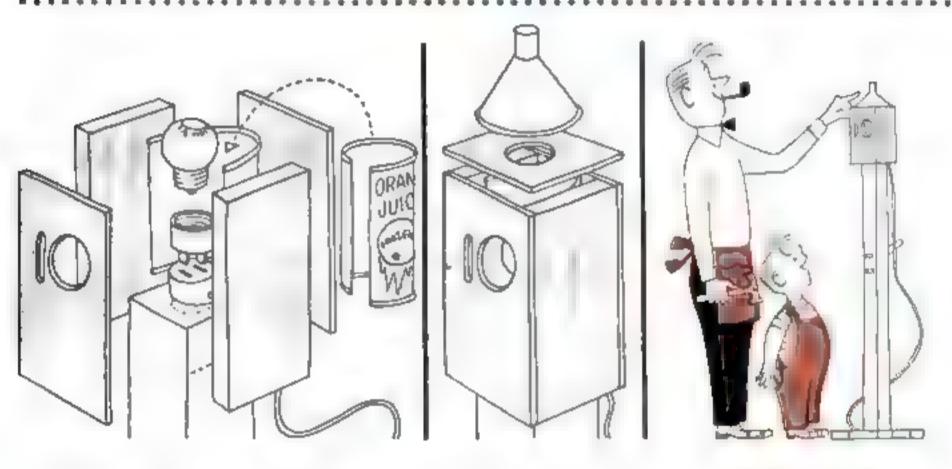
Tom Cavanaugh, Findley, Ohio.

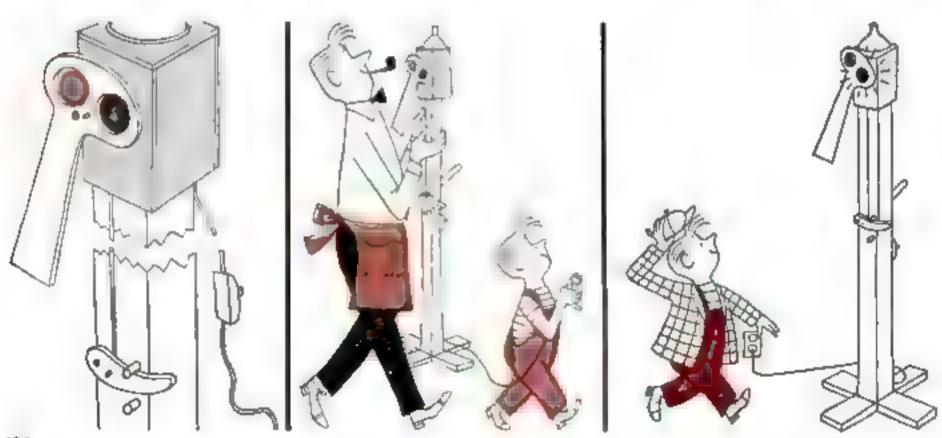


#### Plastic Metal Locks on Nut

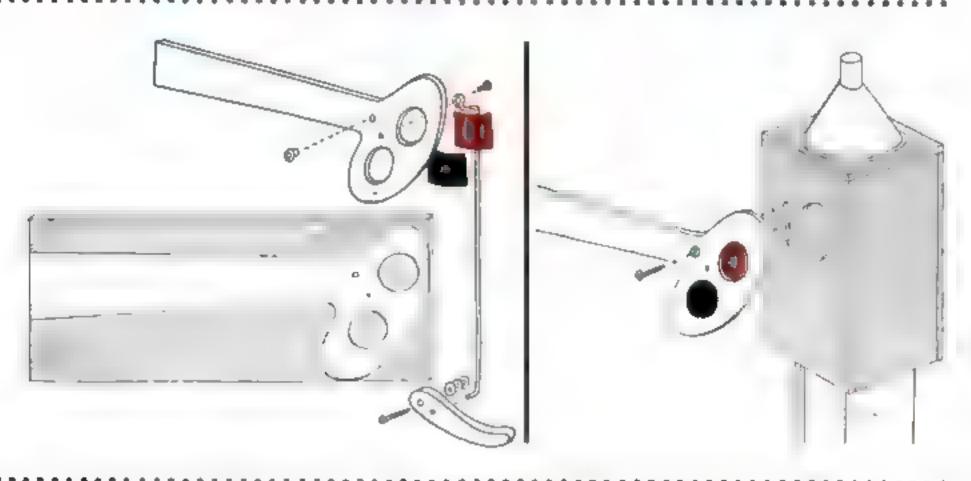
A NUT can be permanently locked in place by applying plastic metal or epoxy glue to the protruding bolt threads. Tighten the nut and clean off grease or oil before application.—John A. Compere, Philadelphia.

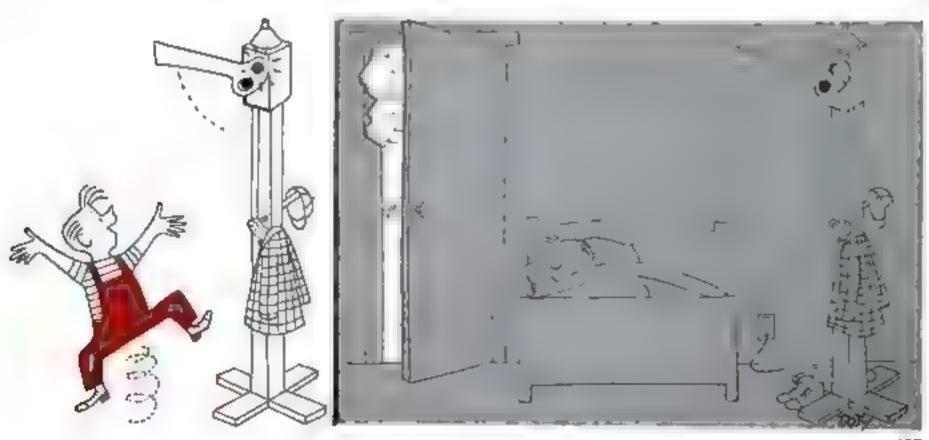








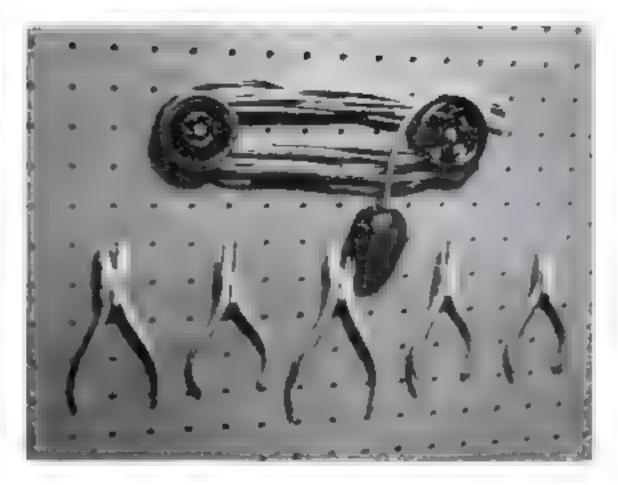


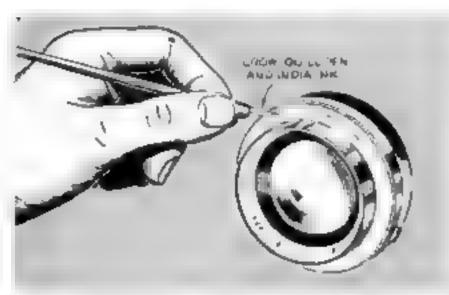




# Spools Make Rack for Spare Cord

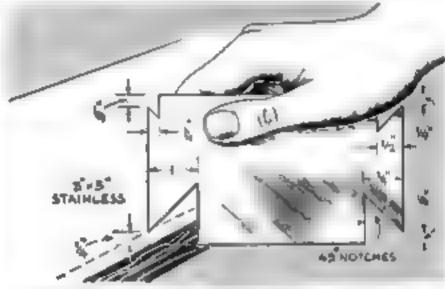
Two old typewriter-ribbon spools mounted on your tool board or shop wall will form a convenient holder for an electric extension cord.—John A. Comstock, Wellsboro, Pa.





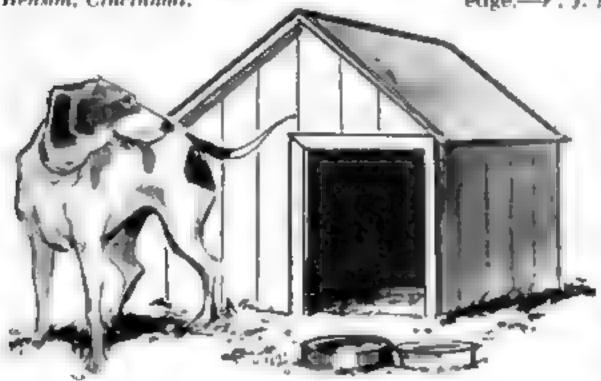
# Restoring Engraved Markings

IF THE coloring in engraved letters and figures on cameras or chrome-finished instruments wears off, use cotton moistened with dry-cleaning fluid to clean out the depressions. Then apply Indua ink with a fine pen. Finish with a thin wash of white sheltac, wiping the excess from the high points immediately.—Walter E. Renson, Cincinnati.



# **Time-Saving Marking Gauge**

With notches hacksawed in its corners as shown, a scrap of stainless steel or other hard sheet stock is a fine scriber. It will scribe lines on wood, plastics, and metal at four predetermined distances from the edge of the work. If you take care to hold the gauge radially, it will follow curves as accurately as a straightedge.—V. J. Montalto, Chicago.



# Off-Center Door Best for Dog

It's advantageous—for the dog—to put the door toward one side when building a doghouse. With the door so placed, rather than in the center of the wall, a pooch inside can keep clear of the opening for better protection from wind, rain, and snow.—E. L. Ryer, Hawthorne, N. Y.

# Heating Elements fix-it file

#### Resistance-Heating-Element Table

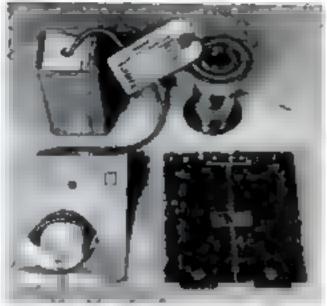
WIRE BIZE	0.0.	OHMS PER INCH"	USES
28 25 24 23 22 22 22 20 19 18	KK	7.2 7.5 1.8 1.8 2.1 2.45 1.1 0.63 0.41 0.65	Mair dryers Hotplates, cooking welfs Hotplates, cooking welfs Hotplates, cooking welfs Coffee makers, hair dryers Toasters, grills, waffie irons Reflector heaters, grills Stove units, fan heaters Range units, fan heaters Hotplates, space heaters Range ovens, broilers Broilers Broiler and oven units

W RE	#E OHMS   PER FOOT   26   26   102   18   023		Г	Usts		
26 22 18			For winding low-wattage coils Low-wattage coils, hotpiates, heaters Heaters			
RIBE	ON	WIR	Ξ			
W26		PER FO		WEES		
	0031	5 8	Π,	Toaster and percolator elements		

To find the ohms needed, square the volts and divide by watts: saits a voits

% # .0045

Toaster and Iron



EASIEST REPLACEMENT of a heating element is with a ready-made one -if you can find it. But often you can do the job at a fraction of the cost by buying the proper wire at an electrical-supply store and winding it yourself. Exact duplication is not essential but match should be as close as possible. Use formula and table at left to find what to buy. After you find ohme required, divide by ohms per inch (or foot) to find length. Use the same wire size for replacement as that of your old heating element.

# Check these points first if element won't heat



BROKEN OR BAD CONNECTIONS are the most common trouble (above). Heat causes threads to exidize and loosen. Check terminals at plug, switch, and heating element. Be sure connections are clean and tight. Switches wear out in normal use, but dirt can cause excessive arcing in switches and

hasten their failure. Check for faulty switch by connecting line cord directly to the element (photo at right). If the element now heats, the switch is bad. Dust and lint around exposed conductors can cause a partial short, even start a fire. It's wise to clean around the elements and switches frequently.

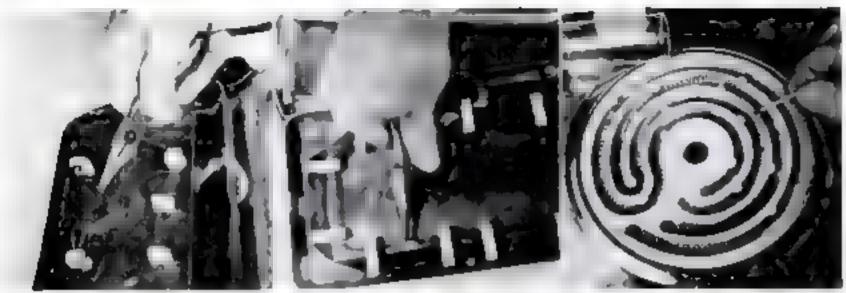
# How to replace a defective switch or wire

WHEN REPLACING A SWITCH, especially a high-low type or a switch that controls the heater and a fan, sketch the wire positions to be sure you connect the new switch properly (left). Replace burned-out or broken asbestos-covered lead wires with No. 16 stranded

nickel or copper wire (center). Nickel will last longer. Broken leads on electric-range elements should be fitted with new terminal lugs. Cut off a half-inch of the insulation and squeeze the lug on the exposed wire (right). Be sure to remove the range's fuse.



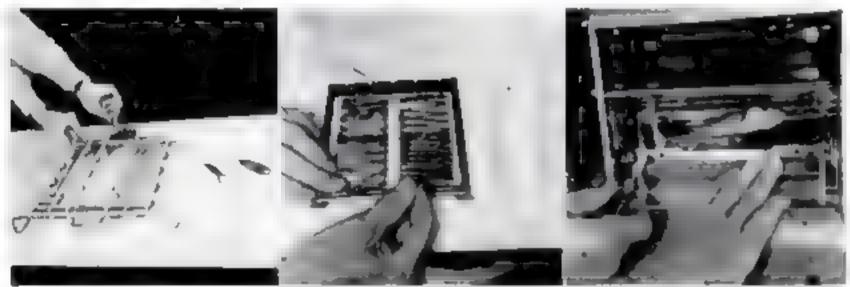
# How to repair a broken element



WHEN A COILED ELEMENT BREAKS close to the terminal, it can be stretched and reconnected without noticeably affecting its performance (left). If it breaks somewhere along its length, you can splice it with a squeeze-on sleeve that costs only a few cents (center). Breaks can also be welded with a powder

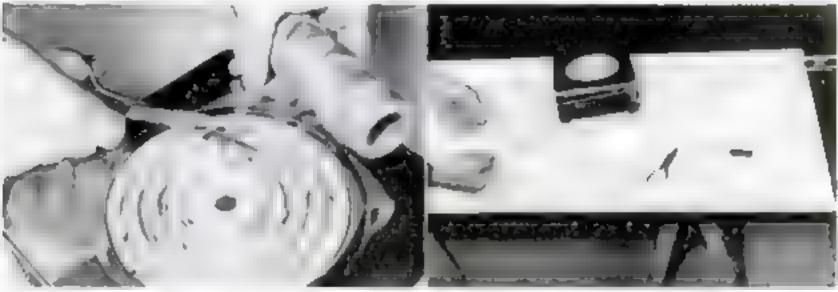
called Chanite Element Flux. Clean the ends of the wire, bring them together and apply the flux (right). Turn on the appliance. The element's own heat will weld the joint. Repairs to a heating element are seldom permanent. It's a good idea to replace a temporary fix with new wire as soon as you can.

# How to replace an element



A COMPLICATED ELEMENT PATTERN, such as the one at left for an electric oven, should be sketched before the old element is removed. Uncoil plenty of wire for fastening ends to the terminals. Ribbon-type element wire (center) can easily be wound over mica or asbestos sheets in irons and toasters. Number

the notches before you remove the old ribbon so you can space the new wire accurately. The spiral-grooved support at right automatically determines the wire length, but you must know the gauge. Take a piece of the old wire to the hardware dealer so he can give you an exact replacement.



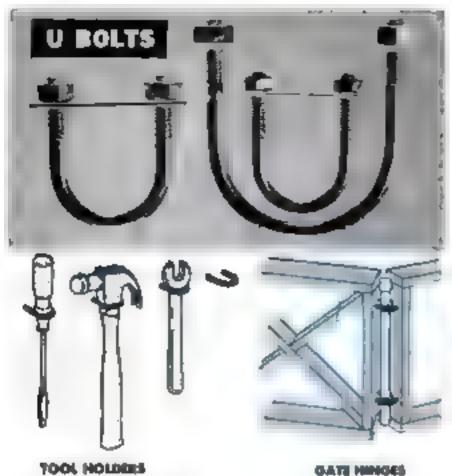
MEASURE THE DIAMETER of a helical coiled element and tell your dealer the wattage. He should be able to give you the proper (unstretched) length of wire. You can check this with the table on the preceding page.

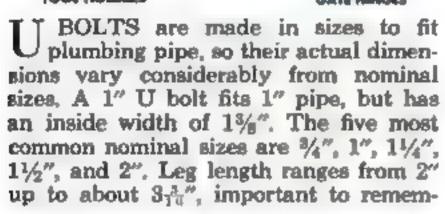
To find the stretched coil length, lay string over the course the coil must cover and cut it to that length. Stretch the replacement coil to the exact length of the string, lay it in the holder, and connect the two ends.

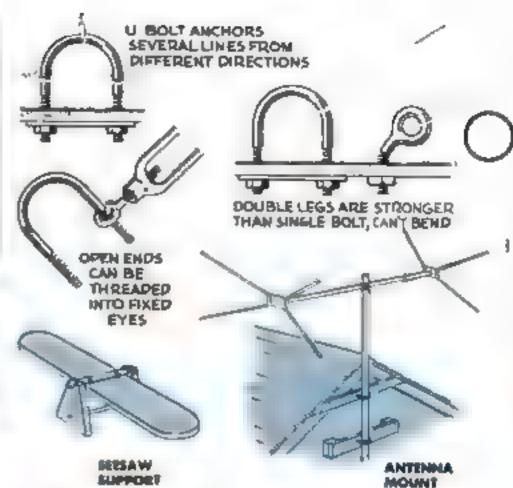


Turnbuckles offer an easy way to take up slack in a brace or line. Their nominal sizes usually represent the amount of take-up that each provides: A 3" turnbuckle can be tightened 3" between its open and closed positions. The average hardware store stocks five or six sizes, ranging from about 11/4" take-up to as much as 6". You can buy turnbuckles

with eyes at both ends for permanent fastenings, or with a book at one end to permit quick attachment and release—handy in temporary tie-downs or boat rigging. Turnbuckles with books at both ends must be specially ordered. Sketches showing uses for turnbuckles, U bolts and eye bolts are courtesy of The Washburn Co., makers of Androck hardware.



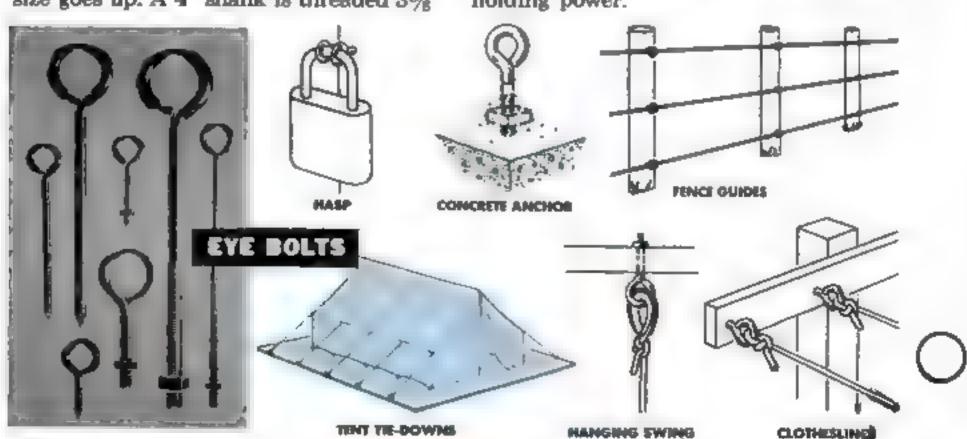




ber when you plan to use U bolts in wood. Sizes up to 11/4" can be used in 1" stock, but are not long enough to pass through 2" stock; the 11/2" and larger sizes can be used in either 1" or 2" stock. Because U bolts are open-ended and are held by two legs, they are often stronger and easier to use than eye bolts with closed ends.

EYE BOLTS come in many sizes, from 2" up to giants 12" long, and in eye diameters from about ½" to 1¼". Contrary to some belief, it is not necessary to buy a large eye to get a long shank. You can get a small eye with a long shank or a large eye with a short shank, depending on your needs. But the proportion of shank that is threaded decreases as shank size goes up. A 4" shank is threaded 3%"

—almost its whole length; an 8" shank is threaded 4"—only halfway. This is important to remember in selecting an eye bolt so you won't run out of thread in tightening up against the stock. Where you can't run a bolt through and reach it from the rear, a lag-threaded eye can be screwed directly into wood. However, the machine-threaded eye has greater holding power.



# Using Chain Saw

HETHER you own, borrow, or rent a chain saw, these few tips will help you get the most out of it-easily and safely. Like any other power tool, however, a chain saw is potentially dangerous. Respect it.

Binding in the cut is the biggest single cause of sawing difficulties. To prevent

it, remember:

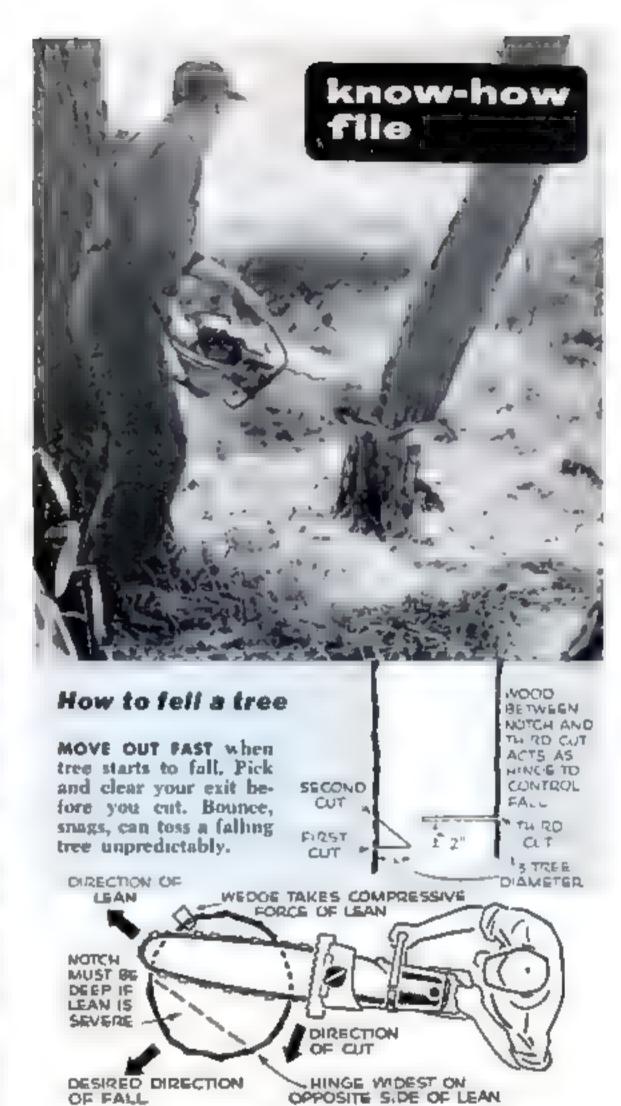
Support at both ends of a log causes top bind. The main cut must be made from the bottom.

Support at one end or in the middle causes underbind. The main cut must be made from the top to keep the blade free.

Before felling a tree, plot its fall and make sure the path will be clear of other trees, buildings, and fences. Clear a path of quick retreat for yourself, too. Trees don't always fall according

to plan.

Safest and easiest saw performance depends on chain condition. Keep it properly adjusted, the teeth sharp. Give the chain plenty of oil, often.



DIRECTION OF FALL is controlled by location of notch, angle of final cut, natural lean of tree. Leave binge wider on side apposite less, prevent nuch with wedge.





BUCK LOGS FAST on horses made by notching sturdy sections. De-himbing, first bucking can be done while felled tree is propped by branches.

WHEN LOG IS WIDER THAN SAW, first cut one side 1/4 through, make a like cut on opposite side, then cut up from bottom to prevent bind.

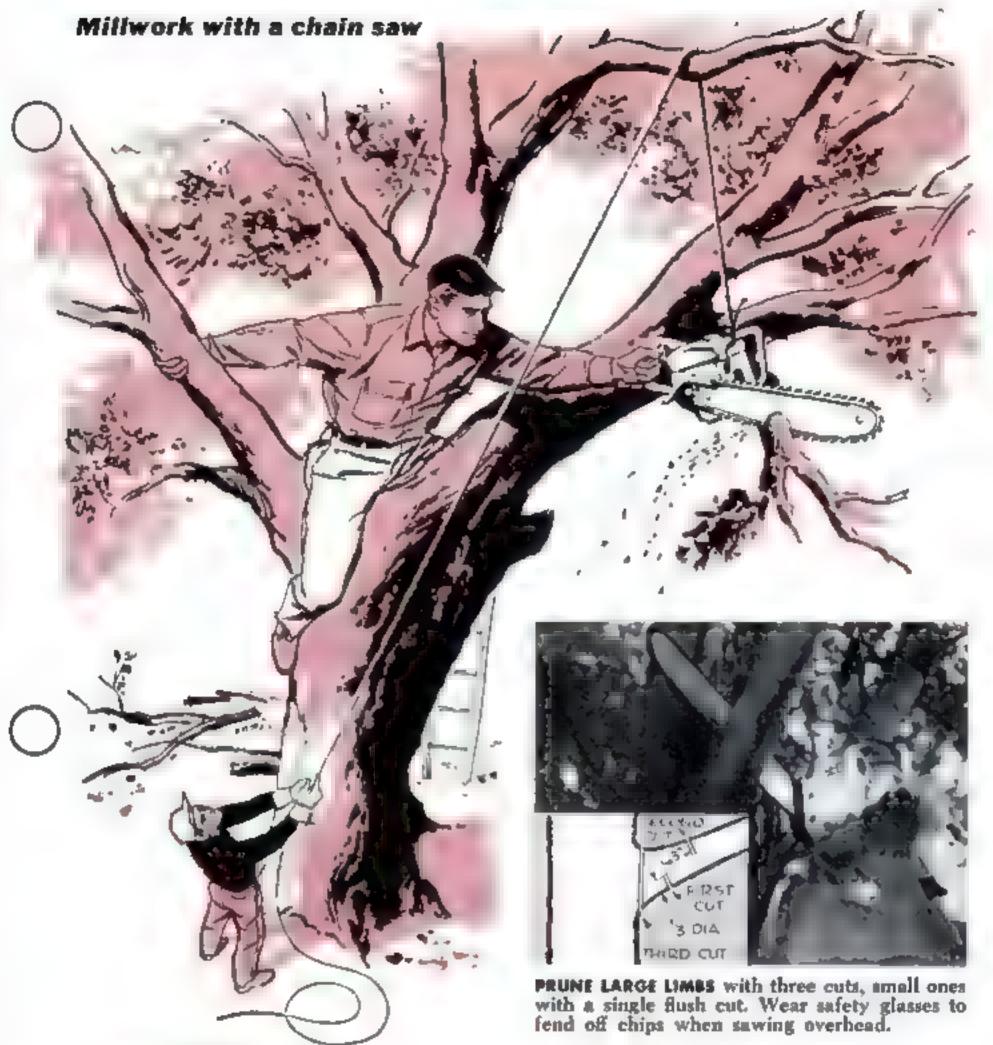
# Tips for First-Time Renters

ASAW with direct drive cuts fast and is the best choice for small-diameter, trimming, notching, and boring cuts. But it stalls easier in tough cuts. A gear-drive saw runs slower. But it will bug down and cut even under severe punishment and with a dull chain.

If possible, pick a saw with a chain bar about 2" longer than the

largest cut you expect normally to make. You can double-cut larger logs.

You have a right to expect that the saw will have a freshly sharpened chain. Rental fees usually also include extra chain oil and motor fuel. If you run out, follow the instruction tag religiously. A saw won't last long without oil and properly mixed fuel.



# Pruning the easy way

TO CUT SLABS AND SEAMS, roll the log on temporary supports. Start perpendicular cuts carefully; keep the saw nearly vertical.

STRAIGHT SLABS are assured by crayon mark full length of log. Nail temporary props to log to hold it steady for full-length ripping.

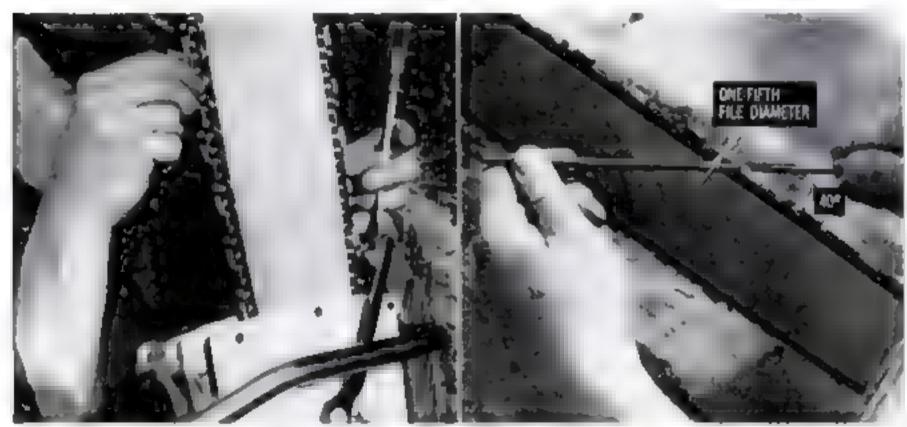




First three cut bottom, both sides. Last cut is made at top to free the piece without bind.

NOTCHING IS EASIEST if two cuts at sides of notch are made first, then saw is plunged between them from side. Lay out cut with chalk.

# How to keep the chain in shape



CHECK BLADE TENSION EACH FUELING. It's right when one tooth tail just clears the edge of the blade as it's lifted—not stretched—at center.

TO TOUCH UP BLADE, use the chain file carefully. File too deep and chain will run out, feed poorly. File too shallow and chain will jerk.

# 10 Rules for Saw Safety

- 1. Be sure cut is safe before starting.
- Fuel and start the saw in different areas to prevent fires.
- 3. Discourage too-close onlookers.
- 4. Start the saw on firm ground.

  Never allow anyone to "help."
- 5. In use, keep both hands on the saw.
- 6. Always run saw wide open in cut.
- 7. Work above a log that could roll.
- 8. Keep the chain out of the dirt.
- 9. Cut engine before carrying saw.
- 10. Carry saw with blade behind you.





#### Winterizing Window Boxes

AFTER heavy frost sets in, brighten window boxes with decorative evergreens, bittersweet, or ruscus. Chicken wire stapled across the top of the box offers a holder that keeps foliage neat and erect.—

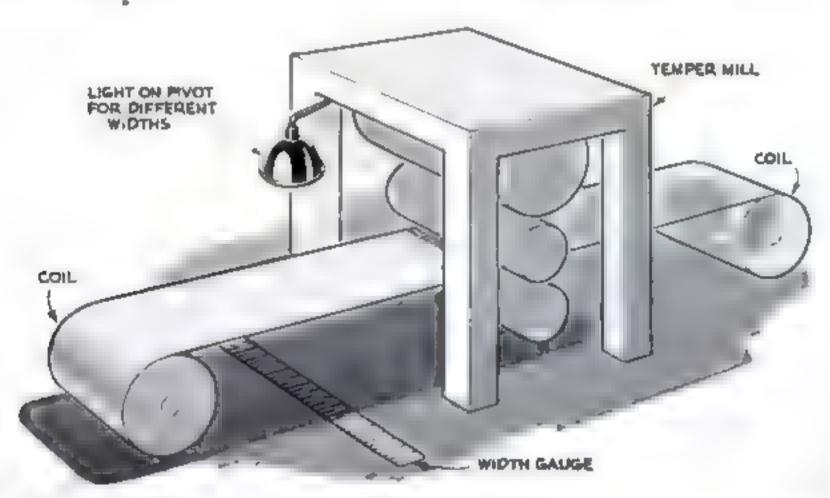
Rodger Darling, Revere, Mass.



# **Waxing Shears for Better Grip**

SHEARS will seem much sharper, especially when cutting thin paper, if the cutting edges are lightly coated with candle wax or paraffin. The waxed edges grip the paper better and keep it from slipping.

—Kent Martin, Detroit.



# Centering Rolling-Mill Coils with a Shadow

It's difficult to center coiled metal of different widths for feed through a rolling mill. I solved the problem on my machine by placing a spotlight overhead. I line up stock of any width by aligning its shadow edges with the right index marks on a width gauge below.—Steve P. Conkovich, Granite City, Ill.



ARCS WITH RADIUS UP TO 32" can be cut with segment attachment. Cap screw dropped through holes in jig makes pivot. Work is held in place by sharpened metal spurs.



TRUE CIRCLES, one or a dozen, are easy to cut with this jig. Spreading the cleat holds jig in saw. Work pivots on dowel center pin. Thumb screw clamps tongue for proper radius.

Here's a handy piece of make-it-yourself equipment for any home shop:

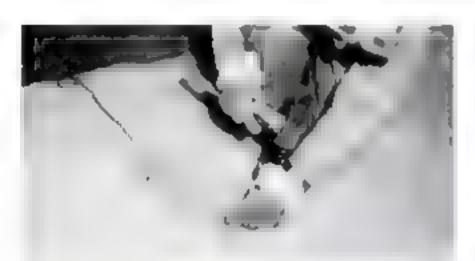
# An Adjustable Jig for Cutting Circles

### By Howard R. Clark

Wood wheels or chair rockers will find this circle-cutting jig a valuable tool. Designed primarily for use with a bandsaw, it can be used on any tool having a table with miter-gauge slots.

For cutting circles, the work pivots on

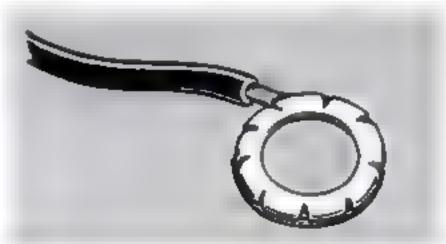
a dowel center in the adjustable tongue of the jig. The jig is slid sideways to line up the center of the tongue with the tips of the saw teeth. Then it's locked by tightening the two 8-32 machine screws, spreading the cleat in the table slot. For cutting long-radius arcs, the swinging arm attaches to the tongue. Metal spurs keep the wood from slipping.



# **Tubing Makes Best Ice Stakes**

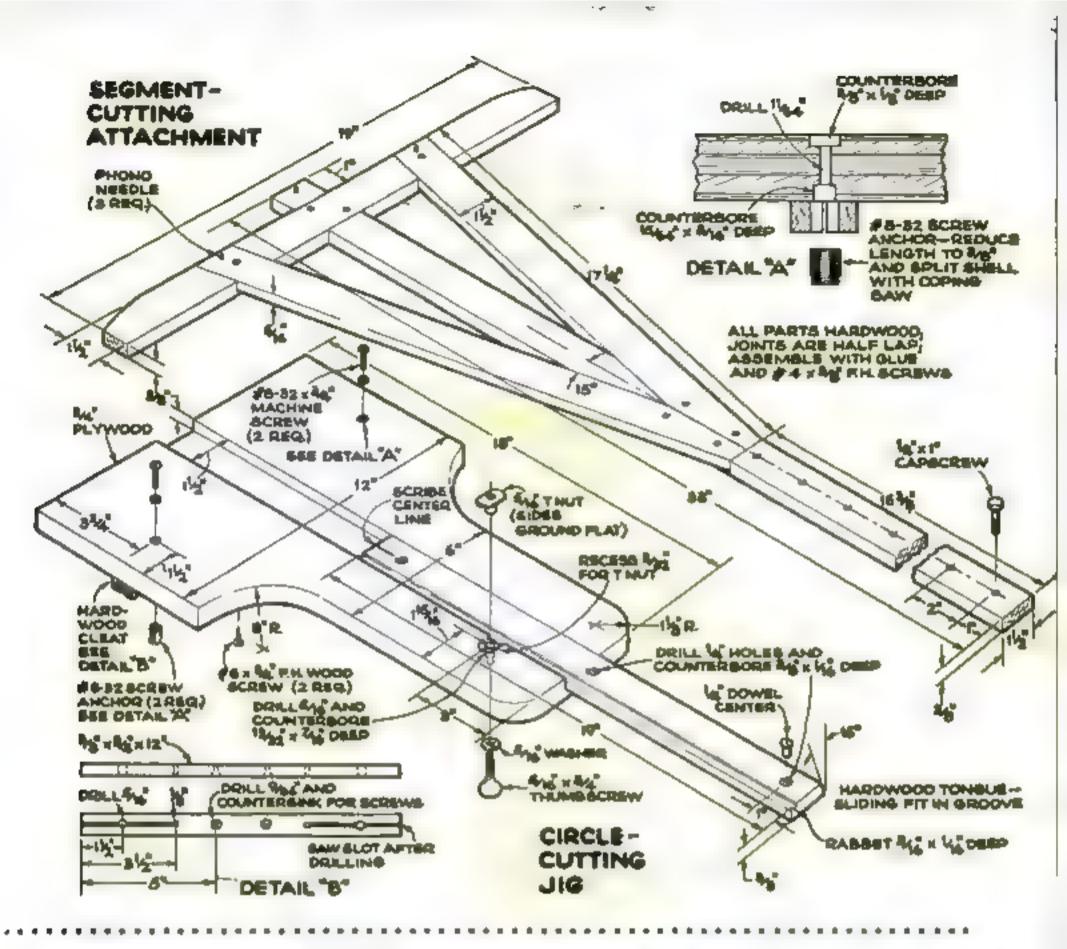
I've found that steel conduit cuts a snug hole when driven into ice or frozen ground to anchor a fish house or tent. Ice from the hole forms a core inside the tube. The conduit stakes hold better than solid ones of wood or steel, as these tend to crack the ice and loosen.—Wayne Rudy, International Falls, Minn.

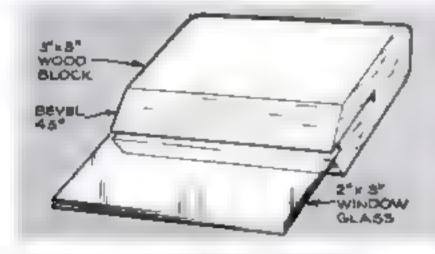
176 POPULAR SCIENCE DECEMBER 1959



#### Wire Terminal from Grommet

ROUND terminals for electrical wires are easy to make. Twist the wire around a plain, unpainted grommet, then set it with grommet pliers. Wires attached in this way won't loosen terminal acrews when pulled, won't jam or twist under the acrews, and they look professionally neat.—James Manos, Brooklyn, N.Y.

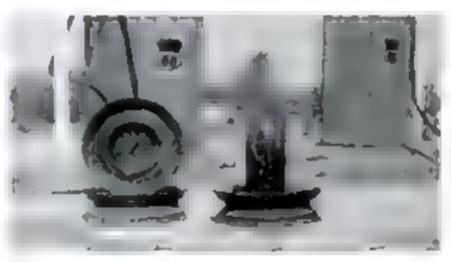




# Scraper from Scrap Glass

A BLOCK of wood and a scrap of broken window make a good scraper. Slot the block, bevel its edges, and round the top for hand comfort. Then shim the glass with masking tape or paper for a tight fit in the slot. The acraper works fast. Just replace the glass when it's dull.—

A. E. Bryant, Lynchburg, Va.

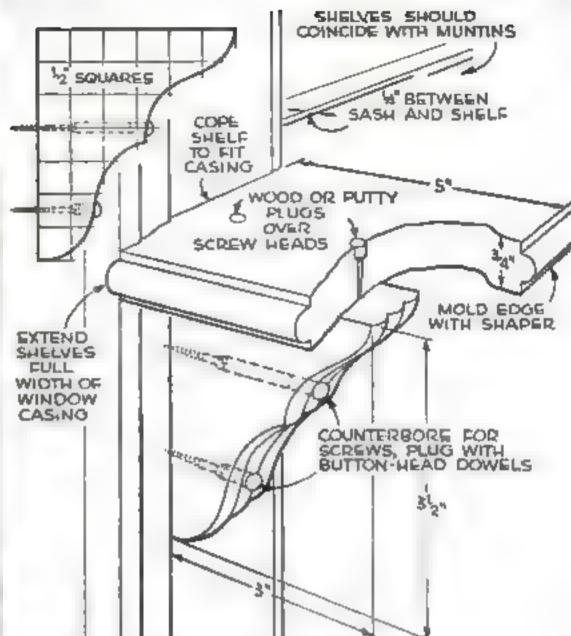


# Heavy Horse from Car Wheels

A PAIR of old car wheels welded together makes a good horse for supporting heavy loads. They won't tip or slip under a car frame. I welded the upright wheel to the hub of the flat one, but to make a lower-sitting horse, you could cut part or all of the hub out of the flat wheel.—J. P. Moriarity, St. Johns, Mich.

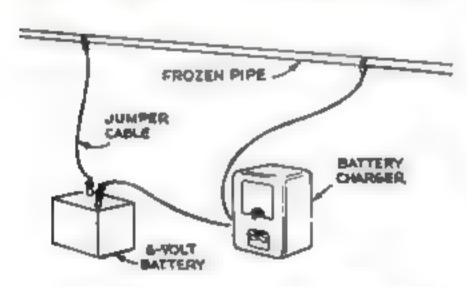






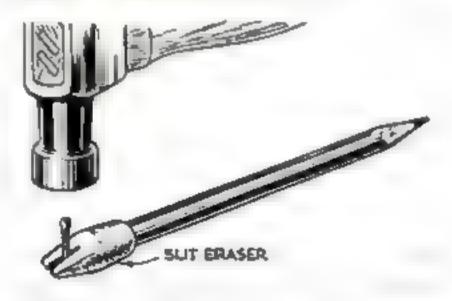
### Window Shelves for Displaying Antique Glassware

Because windows are the best places to catch and reflect sunshine, window shelves are the best spot to show off your antique glassware. These shelves escape the tacked-on look, yet are easy to build. Shaping the edges and hiding screws helps them match their surroundings and contents.—Hi Sibley, Nuevo, Cal.





When you have to thaw out a frozen water pipe, try putting it in a series circuit with a fast battery charger and a six-volt storage battery, as shown. I've found that 100 amps passed through a 1/2" pipe will thaw it out in 10 minutes or less. If the pipe is over 10' long, my procedure is to move the clip from the charger back to the second battery cell so that I still get 100 amps through the circuit.—Ralph W. Junk, Mt. Sterling, Ohio.



#### Slit Eraser Holds Brads

Driving brads in hard-to-reach spots? You'll save your fingers from injury by placing the brads in a slit cut in the end of a wedge-shaped pencil eraser.—G. E. Hendrickson, Argyle, Wis.

▶▶▶By soaping the surface of a grinding wheel, you can grind soft metals—copper, aluminum, or brass—without loading the wheel with metal. Use a cake of hard soap.—A. E. Bryant, Lynchburg, Va.

178 POPULAR SCIENCE DECEMBER 1959

Like to make an unusual aluminum tray? Try this—

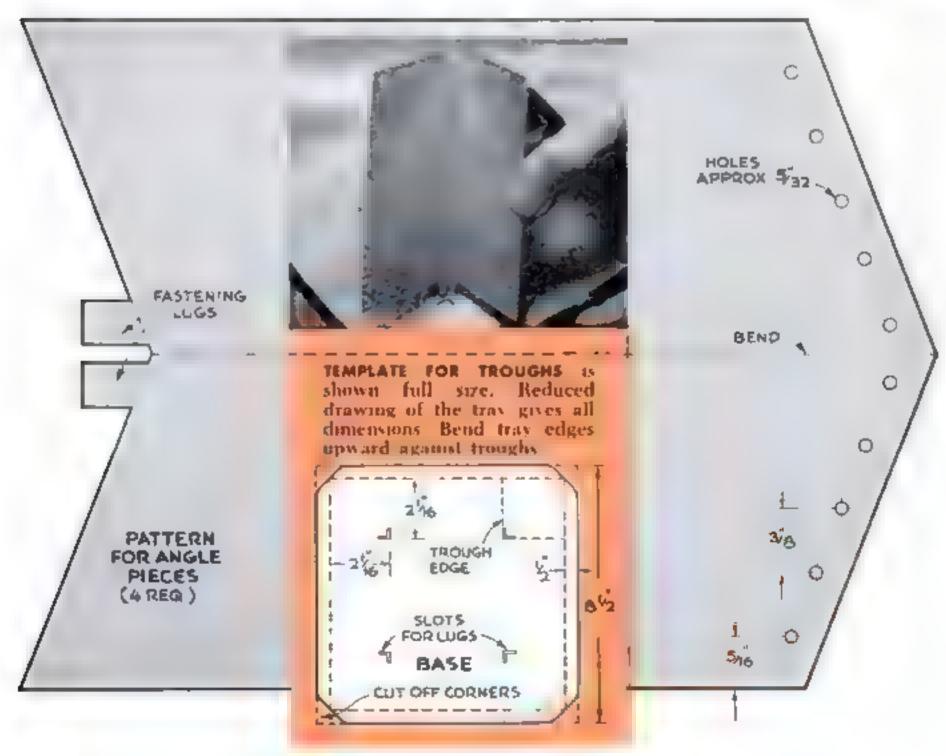
# Snack Stacker



HOLIDAY serving will be simplified by this snack tray. It holds four columns of cookies, crackers, or midget sandwiches.

Cut the tray and four inclined troughs from embossed do-it-yourself aluminum. Drill #" lacing holes along the tops of the troughs. Insert the trough-fastening lugs in L-shaped slots cut in the tray and

bend them over to fasten the troughs in place. Bind the tops together with plastic lacing or strips of soft zinc or aluminum. Punch two holes through opposite troughs for the carrying handle—an eye formed from a 10" piece of 1/8" aluminum wire—and crimp the ends in place. Cement cork disks from four bottle tops to the underside of the tray.—Walter E. Burton.



# Adding a Hearth to a Prefab Fireplace



PREFABRICATED FIREPLACE offers charm of an open fire at low cost. Protective hearth and backwall are sometimes specified by local building codes, which classify prefabs as portable wood stoves.

M AYBE you've been afraid that a prefab fireplace might get too hot to be put over a wood floor or near a wall. A brick hearth can be laid over any type of floor—wood or concrete—and adds both protection and the warm, luxurious look of a permanent fireplace. A backboard of corrugated hardboard and aluminum foil circulates heat and guards the wall.

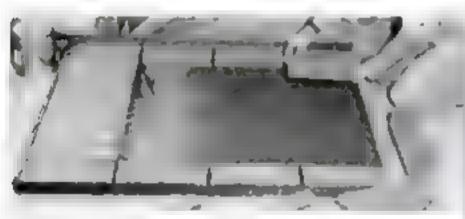
The hearth—about a foot larger than the fireplace all around—was made by setting bricks in ceramic-tile adhesive. A one-by-two frame was used to shape the hearth and contain the grout.

Grouting-filling the crevices between

the bricks—was done before the adhesive was dry. One part of portland cement was mixed with two parts of plaster sand, then watered to a thick cream.

When the grout was nearly dry, it was smoothed and the excess was washed off. Replacing the one-by-two with quarter-round molding and sealing the bricks with spar varnish finished the job.

The backboard is a sheet of corrugated asbestos-cement hardboard, nailed to the wall over a layer of reflective insulation. A ½" gap was left at top and bottom of the sheet to provide air circulation behind the panel.



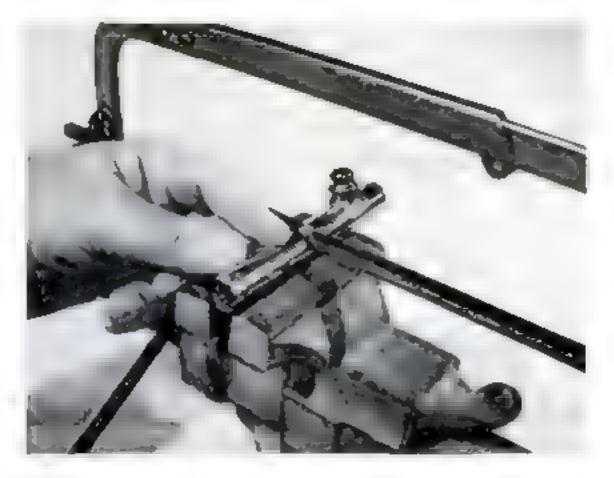
HEARTH DIMENSIONS were planned to take whole Roman bricks without cutting. Bricks were spaced 1/4" apart in ceramic-tile mastic.



REFLECTIVE-ALUMINUM INSULATION underlies sheet of corrugated asbestos-cement board. Ordinary household foil also could be used.



SCRUBBING OFF EXCESS GROUT takes work to prevent white streaks. Wood frame held wet grout and shaped joints between ends of bricks.



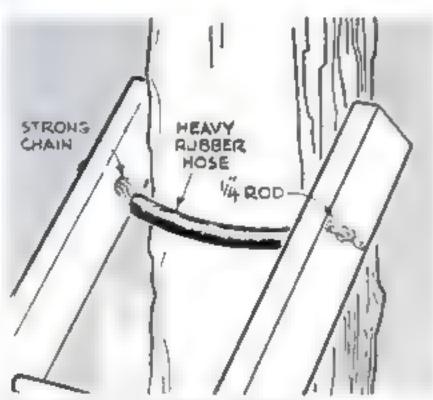


# Cutting Metal Tube in a Bench Vise

When metal tubing is to be cut with a hacksaw, and a vise might crush it out of shape, open the vise only enough to serve as a V block. The tubing then can be rotated slowly as the saw cuts through it.—K. C. Morris, Detroit.

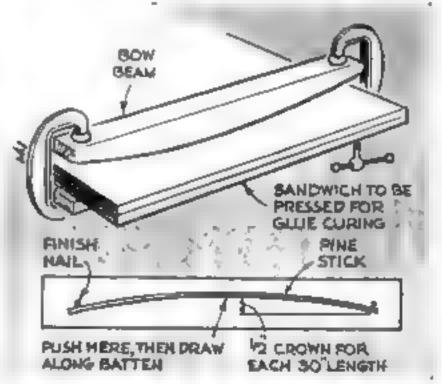
WHENEVER I buy a new pail to be used around the basement, garage, or outdoors, I cover the rolled joint on the bottom with several layers of masking tape. Combined with the rubber mat which I always place under the pail, the tape keeps the metal from rusting from below, along this vulnerable seam.—G. F. Weiher, Doyton, Ohio.

DEPCHECK the hinges if your refrigerator door refuses to shut properly; they're more apt to be defective than the latch. If excessive knuckle wear is causing misalignment, exchange the upper and lower hinges. This puts the door weight on new bearing surfaces. Result: no more sag and a perfect-working latch.—Mabel M. Gooch, Atlantic Highlands, N. J.



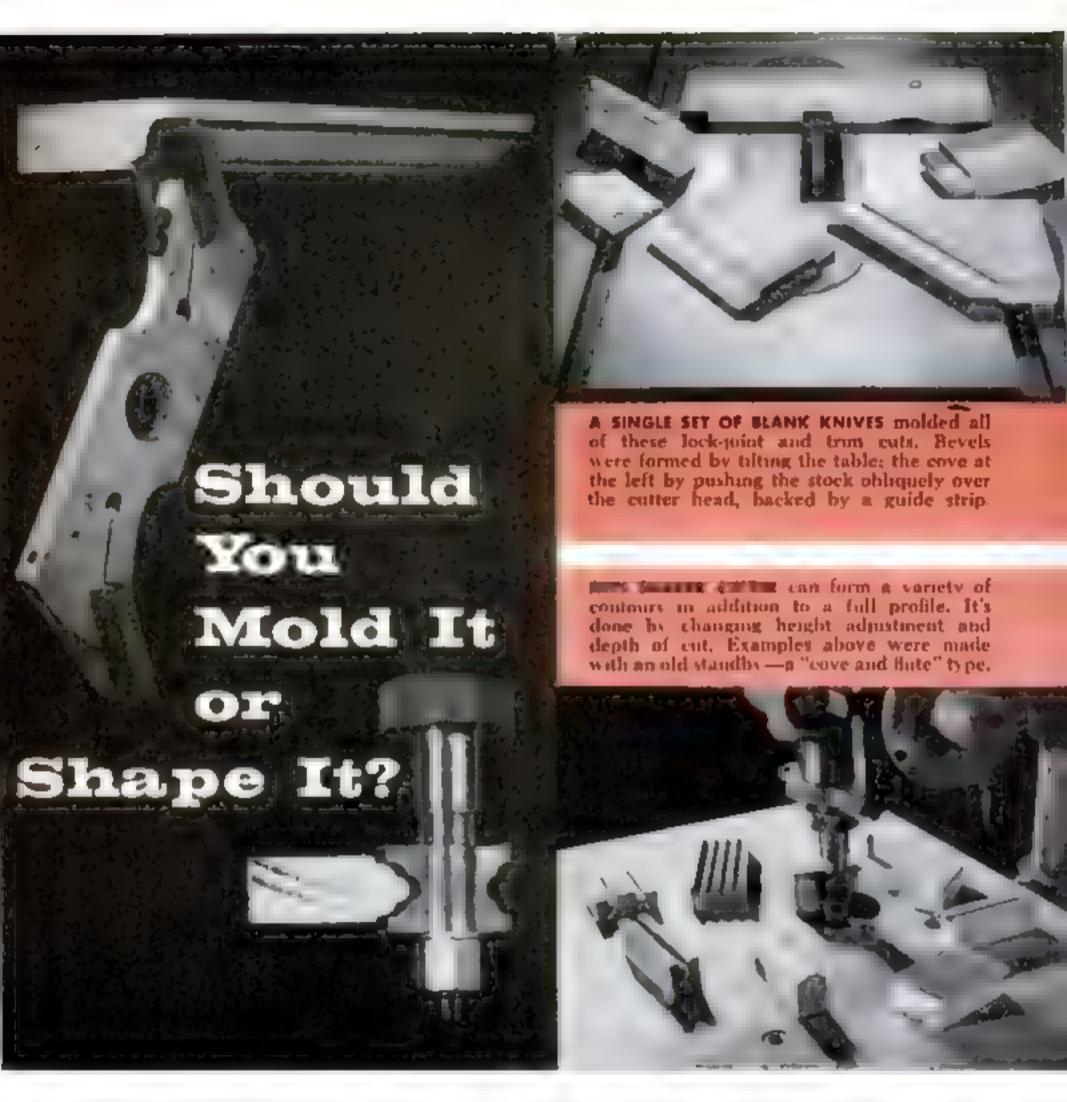
# Flexible Ladder Rung

If you use a ladder where it rests against a post or other round object, alter it slightly to reduce chances of slipping. Remove the top rung and replace it with a length of chain covered with heavy rubber hose. Pass the end links through the rung holes and hold them in place with steel pins. The pins are flattened and drilled at the ends so they can be screwed to the ladder sides.—Burton L. Wollenzien, Grand Junction, Col.



# Bow Beams to Stretch Clamps

With only two clamps and a pair of bow beams, you can exert great pressure uniformly across a broad glue joint—either a panel sandwich or an edge-to-edge joint. Some experimenting must be done to determine the proper amount of crown to the curve, but a ½" crown in a 2½' two-by-four will make a good start. To lay out the crown easily, bend a straight-grained pine stick between two nails.—Joseph Whitehill, Easton, Md.



# By R. J. De Cristoforo

You can buy equipment for either a table saw or a drill press that will let you run off decorative edges and moldings almost as easily as you can saw a board or drill a hole. It's just as handy for such routine chores as forming cabinet-door lips and raised panels, and making all types of lock joints. Sooner or later you'll want a set of these versatile accessories.

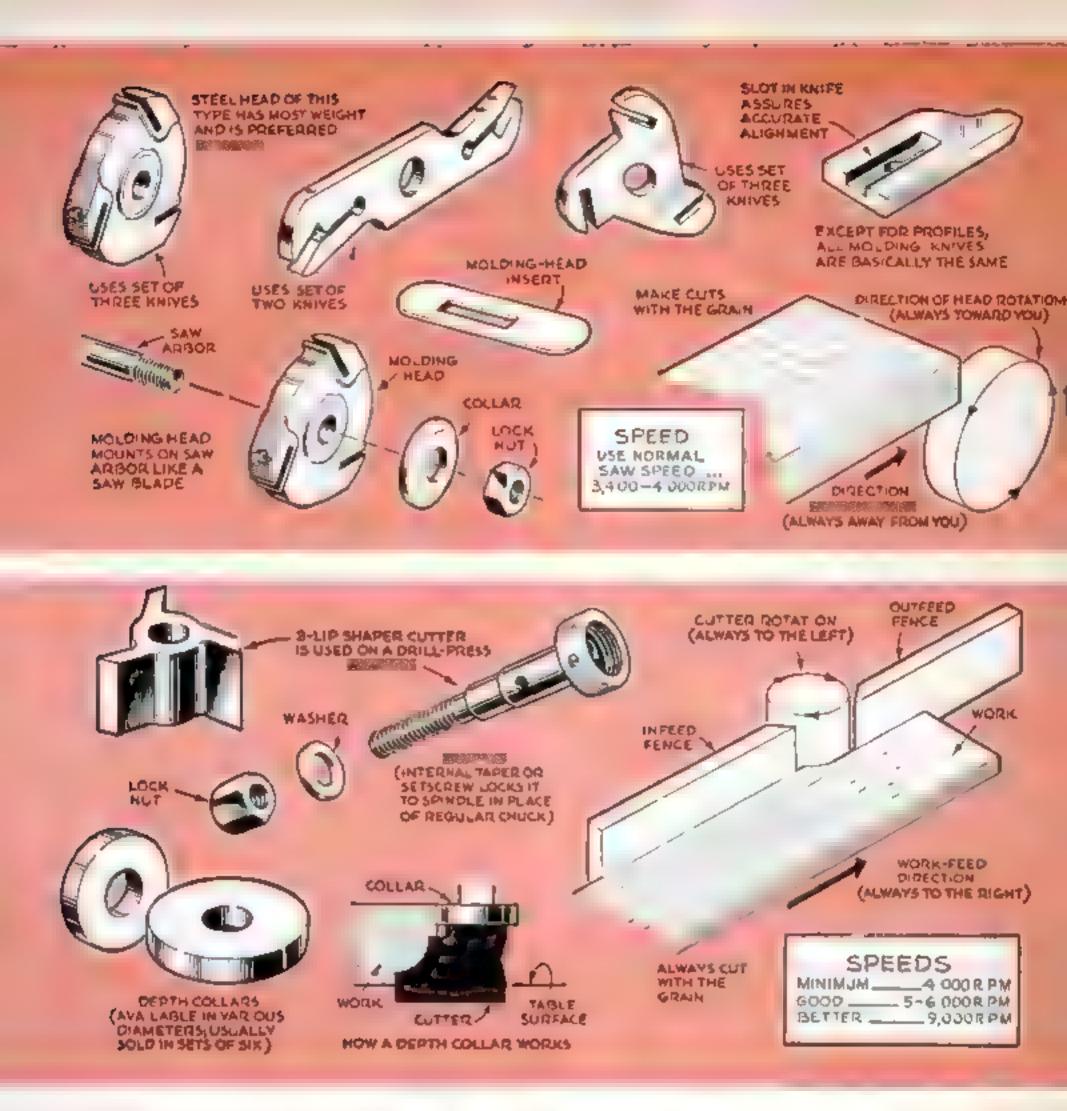
If you own both a saw and a drill press,

this can pose a problem. The two tools require different types of equipment. Although they'll do comparable jobs, each tool has the edge on the other for certain kinds of finish-forming. Which of the two power rigs will it make the most sense to equip?

Before weighing the pros and cons, let's see how the accessories work.

Molding. The basic attachment for a asw table is a bar or disk called a moldingcutter head. Placed on an arbor, with a set of specially contoured blades locked

182 POPULAR SCIENCE DECEMBER 1959



in its slots, it surface-forms stock pushed along the rip fence and over it. By using different sets of blades, varying the depth of cut, tilting the table, and resorting to multiple passes, you can get an almost limitless number of trim designs, or cuts for rabbets, tenons, tongues, and grooves. Professional cabinetmakers call this operation molding

Shaping. Finish-forming on a drill press calls for a spindle adaptor and a shaper fence attachment. The first is a shouldered shaft that takes the place of

the drill chuck Conventional shaper cutters—the kind with a center hole and three lips—slip over the free end of the shaft and are snugged up tight against the shoulder with a lock nut. The shaft is long enough, incidentally, to accommodate several cutters.

The shaper fence does the same job as a rip fence on a saw. Bolted to the drillpress table, it offers a bearing area for work stock being fed across the cutters. Again, you can produce all sorts of molding joints by using cutters in multiple combinations and changing the depth and breadth of cuts. But technically speaking you're shaping, not molding, the wood.

How they do it. Both machines cut in a plane that is at right angles to the driving spindle. But with a saw the arbor is horizontal; with a drill press the spindle is vertical. This determines the position of the work. More important, it may make cuts easy or difficult to handle. For example, it's more convenient to form a cabinet-door lip on a large panel with a drill press, because the stock can be held flat on the table. With a saw, the same cut must be made with the work placed on edge. This is hard to do without tilting and gouging the wood, unless you provide a high supporting fence, and maintain firm pressure against it.

On the other hand, let's say you want to run a groove in the face of a panel, as opposed to the edge. There, the saw table offers maximum support. Also, the overhead position of the drill-press spindle makes it impossible to stand anything wider than three or four inches on edge. The same restriction does not hold for the saw, which can make cuts in the surface of any size panel.

For running off circular or curved edge cuts, the drill press is your best bet. Here you use collars on the spindle to control the depth of cut, and fulcrum pins on the

# Molding with a table saw-

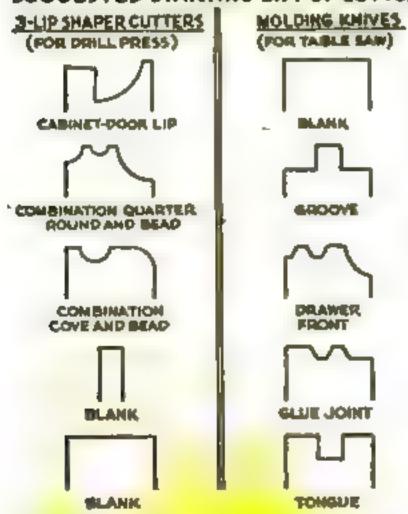


surface-cutting BIG PANELS, as above, is a table-saw exclusive. To make similar shaper cuts, the work would have to be placed on edge, and the drill-press spindle won't accommodate anything higher than three or four inches.

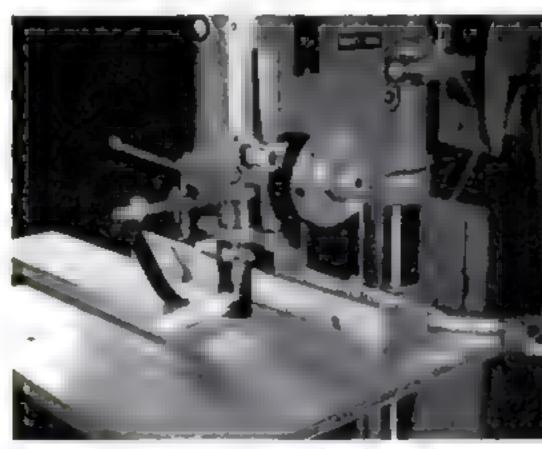
table to brace the work while you start passes. While the table saw will also do curved cutting, you need special jigs and fixtures that take time to make and space to store.

The wrap-up. Weighing the advantages of each rig, it's obvious that the ideal set-up is to own both basic accessories—the molding-cutter head, and the spindle adaptor and shaper fence attachment. This isn't a costly investment. Where you'll save money is in buying the most useful knives and cutters for each. Use

# SUGGESTED STARTING LIST OF CUTTERS



# Shaping with a drill press-



snaper fence attachment guides the work while the table offers firm support. When the entire edge of the stock must be removed, the out-feed fence should always be moved forward enough to support the "after-cut."

# two examples of cuts for which it's ideally suited



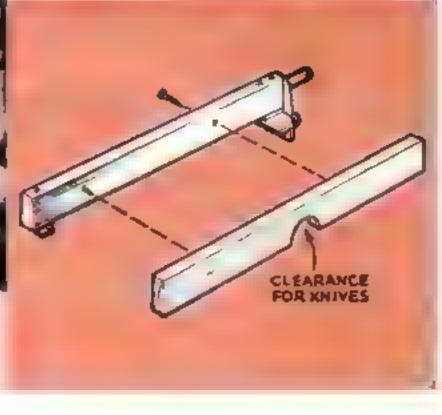
WOOD FACING, screwed to the rip fence, permits cutting to the extreme edge of the stock. The picture frame above is being made the easy way. The square stock with butt-jointed corners is edge-molded after assembly.



Think of drill-press shaping as serving most often for decorative purposes, and table-saw molding as being best for functional work

So you won't wind up with a drawerful of cutters you don't really need, bear this further thought in mind:

Most cutters having fancy profiles are combination types. That means they're intended for partial cuts rather than fullprofile cuts. A good example is the



"quarter-round and bead" design. With proper adjustment this will give you two sizes of quarter-round plus a bead. Another representative shape of this kind is called the "flute-bead, quarter-round and ogee."

Usually the name of the cutter is the tipoff as to whether it's intended for full-profile or partial cuts. If you go for combination types—and they're a good investment—don't buy full-profile cutters that only duplicate one or another of your combination cutters' contours.

# the easiest way to form decorative edges



MULTIPLE-CUTTER SETUPS are a handy shaper feature. By mounting two or more cutters on the spindle adaptor you can run off such things as a decorative edge cut and a panel-insert groove with just a single pass.

current specialities are shaping curved, irregular, and internal edges. Note how the collar on the end of the spindle adaptor controls the depth of cut. The stock is always moved from left to right against the cutter lips.



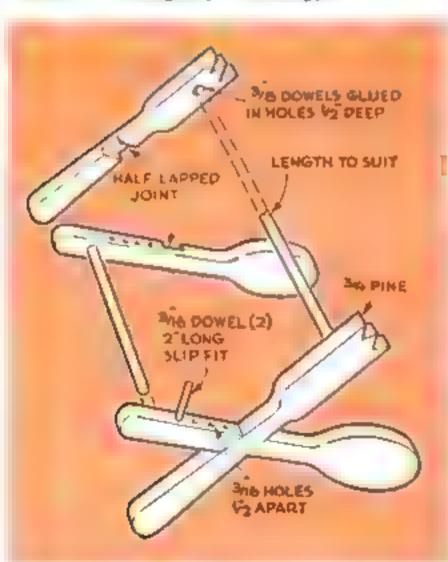
crossed cuttery stand holds several closed books. To prop open a book, short dowels are inserted in holes in each of the spoon handles.

How to make-

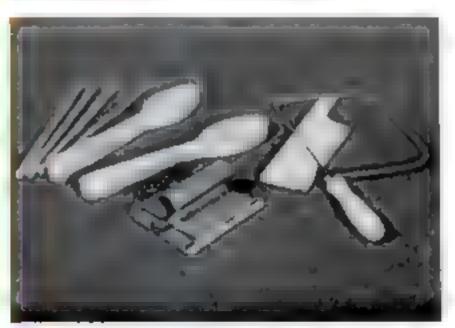
# A Fork-and-Spoon Rack for Cookbooks

HERE'S a one-evening project to please the cook in your house. It's a dual-purpose cookbook rack—it'll store several books, or hold one open for easy, no-hands reference.

The parts are cut from scrap white pine and dowel stock. Real kitchen utensils can be used as patterns. Transferring them will be easier if designs are first cut out of heavy paper or cardboard.—
Frank V. Rodgers, Flushing, N.Y.

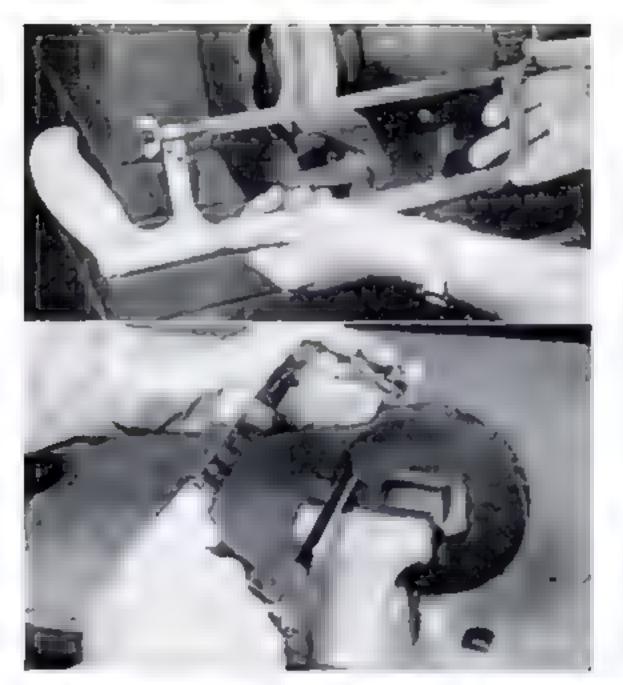


ACTUAL UTENSILS serve as patterns for cutting the parts. Pieces are crossed with half-lapped joint in a shallow "X," then sanded.



PARTS ARE FEW AND SIMPLE: Dowel locations are determined by size of books; the three that form base to support books can be any length.

IAS POPULAR SCIENCE DECEMBER 1959





#### Modifying Saw to Cut Rubber

An ordinary hacksaw blade, sharpened to a knife edge, makes an ideal tool for cutting thick rubber. The blade will work best if the teeth are not completely removed. An old blade used this way is just as effective as a new one. Wet the blade to reduce friction.—H. J. Gerber, Stillicater, Okla.

►►► A STRIP of electrician's rubber tape cemented to the underside of a rule will keep the ruler from alipping on slick surfaces.—John A. Stockton, Pittsburgh.



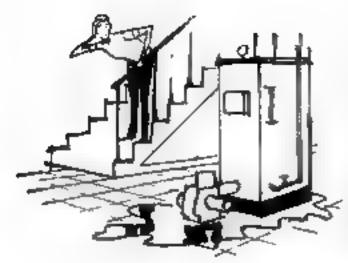
# Flower Frog of Hardware Cloth

HARDWARE cloth can be used to hold cut flowers in any size, shape, or depth of vase or bowl. Cut two pieces to fit the desired container and join them with a bolt. Use an empty thread spool as a spacer, and the bolt end as a handle for lifting the frog. The frog will hold cut flowers at any angle. Galvanized, it resists rust.—Ruth Waggoner, Sacramento.

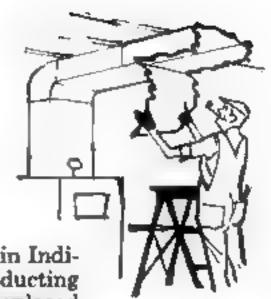


# **Bottle Warmer Heats Test Tubes**

AN ELECTRIC bottle warmer provided with a hardboard cover is a convenient heater for test tubes in the home laboratory. A hole in the center of the cover keeps the tube upright. A teaspoonful of water will quickly heat the test tube, the concentrated heat lasting for about three minutes before automatically turning off.—Ben Murrow, Lansing, Mich.



A MAN in New York, wondering why his house was not warm, went to the cellar to investigate. Water was leaking from the boiler. House and heater were only seven years old, yet the leak could not be fixed. He had to spend \$900 for a new unit.



THE well-heeled owner of a one-year old house in Indiana finally gave up in despair. The aluminum ducting made such a racket he had it all torn out and replaced at great expense—the only way he could have quiet.

# Whether you're buying or building a house, you'll be dollars

#### By A. M. Watkins

EN in the heating industry say that stories like those above are not uncommon. Poor heating and heating breakdowns have become widespread and expensive problems. Some systems last only seven years.

The right time to check out the heating system is before you buy a house—or while ordering a system for a house you're building. You should consider the domestic water heater, too, if it's integral with the boiler.

Hot-water heat. The boiler is the heart of a hot-water system. Many come encased in a fancy cabinet. But don't be fooled—take off the cover and look inside. The tipoff to a well-made boiler, regardless of brand, is an ASME notation on the nameplate. It means that the unit was made according to stiff design standards laid down by the American Society of Mechanical Engineers.

Ask whether the boiler is made of cast iron or steel. A cast-iron boiler "will last forever . . . they rarely go bad," says a top engineering executive

How long a steel boiler will last depends chiefly on the hardness of your house water and the sulfur content of your fuel. Even if you live in a part of the country known for its soft water you should still not take a steel boiler for granted. Islands of very hard water, especially well water, are found in such areas.

This was the case with the New York man, mentioned above, whose boiler rusted out. The dealer had ordered a steel job without checking on the water.

Used in the proper place, a steel boiler will work well for years, and save you a few dollars on first cost, But before accepting one, check the water. It's also wise to look for an SBI (Steel Boiler Institute) monogram. This is additional assurance that the boiler will perform as it should. Not all top-brand steel units, however, carry an SBI rating.

Gravity vs. forced circulation. The performance of a hot-water heating system depends on how well it is installed. It also depends on whether it is a forced-circulation system (with a pump circulating the water to the radiators) or a gravity job.

The only sure way to evaluate a gravity system is to turn it on. Make sure every radiator is getting heat. If you are looking at a two-story or split-level house, compare the radiators on the top floor with those on the lower levels. The top-floor radiators should not get substantially hotter than those below. A gravity job with faulty circulation usually can be cured by adding a pump.

If it's a forced-circulation system to begin with, check the pump for smooth, quiet operation. Then, as with a gravity job, check the radiators for even heat outA MAN and wife moved into a new house in California. Occasionally at first, then frequently, they ran out of hot water when they took baths. In less than a year the entire heating unit—for both hot water and house heat—had to be replaced.



# ahead if you know the answer to-

put. A laggard radiator can mean either a bad air-vent valve, which can be replaced easily, or a basic miscarriage in that part of the system.

Noise is a common trouble with hotwater heat although this does not detract from heating performance. If you are sensitive to noise you should look for cast-iron radiators (available in long, slim baseboard models, as well as the oldfashioned stand-up kind).

Steam heat. Though rarely put in new houses today, steam is common in a lot of older houses for sale. Like hot-water boilers, steam jobs are either cast iron or steel. Cast iron is good for at least 20 years, may last as long as 40. Steel is more of a question mark, depending on the hardness of your water. Have the water analyzed when you encounter a steel steam boiler just as you would with a steel hot-water job. And regardless of whether it is cast iron or steel, look for the ASME seal on the nameplate.

Check a steam system in action for noise, steam pressure, speed of response, and lack of radiator hissing. Banging and pipe knocking when the steam goes on usually mean water trapped in mains or return pipes badly pitched. The latter is expensive to correct.

The water-pressure level in the glass gauge on the boiler should be watched when the steam is building up. It should not fluctuate more than half an inch. If it

# How Long Will the Heating Plant Last?

bounces up and down like a rubber ball something is radically wrong: a dirty boiler, for example. With the steam full up, the water level should not read higher than two p.s.i. on a mild day, five p.s.i. on a really cold day.

Every radiator should get hot in 45 minutes, or an hour at most. Slower response is the tipoff to an undersized or dirty boiler, a crippled job, or fouled-up distribution. Radiator hissing comes chiefly from worn vent valves.

Warm-air heat. A warm-air furnace is nearly always made of steel. Of the over 1.1 million household furnaces turned out in a recent year 97 percent were steel. Cast-iron ones are mainly for coal.

Steel is fine in this case because you are handling air, not water (which may be corrosive). In addition, a modern furnace usually does not get hot enough inside to need thick-skinned cast iron. The blower keeps the air moving through

the furnace at such a clip that the heat is carried off before it can build up to the

top temperature limit of steel.

Some brands, however, may be better than others. One good check with an oilburning warm-air furnace is to find out if the furnace is made according to rules put out in Department of Commerce Standard CS 195. This fact will be in the maker's literature. (No similar standard exists for gas or coal jobs.)

Herb Gilkey, staff engineer for the National Warm Air Heating and Air-Conditioning Association, says most trou-

# 2 Ways to Check the Ducts

• Are they quiet when the system operates? Turn the system on and off a few times to hear for yourself. Noise is caused by lack of enough stiffeners and braces. The racket every time the heater goes on and off (due to expansion and contraction) is what made the Indiana man mentioned earlier have his entire duct system replaced

• Are your galvanized-steel ducts rustproof? Give them the screwdriver scrape test. The protective zinc coat should not flake when scraped. If it does it will probably chip and fall off later by itself, exposing the steel to rust. Look, too, for an LFQ (Lock Form Quality) mark on the metal, evidence of a first-rate galvanizing job that will give you your money's worth.

bles boil down to one or more of six basic causes:

- Ducts that are too small.
- Poor duct layout.
- Not enough, or poorly located, air outlets in rooms.
  - Unbalanced air delivery.
  - Improper furnace-blower adjustment.
- Furnace too small or too big for the house.

Spotting these flaws is not easy unless heating is your business. Your best bet is

to seek out the heating contractor who did the job. Ask him frankly if the job is as good as it should be. Or did he have to meet a low price to get the builder's business? If so, what should be done to improve the system?

It may surprise you to find how open a dealer's mind will be when you ask questions like these. Moreover, you will often be told exactly what should be done to turn a marginal system into a good one.

Gas, oil, or coal? Though the heater (furnace or boiler) in a house may last a long time, the burner mechanism may not. Here are some crucial facts about each type:

Gas burners are blessed with no moving parts and will last from 25 to 40 years, gas men say. Check the nameplate for the approval seal of the American Gas Association (AGA). If it's there, the unit has been checked out according to stiff standards of safety and performance laid down by the AGA's test laboratory.

To be really safe, note the burner brand and call your local gas utility about it. Some utilities have special requirements

in addition to the AGA's.

"Oil burners will last an average of 17 years," says Charles Burkhardt of the Oil Heat Institute of America. This is based on experience with eight million burners, he says. "Actually, it is only a few basic parts that wear—oil pump, motor, nozzle, electrodes, and transformer." By replacing these when necessary the basic burner will last a lifetime.

If in doubt about an oil burner, Burkhardt advises that it be given an instrument combustion test, "Just as you might spend \$5 or \$10 to have a mechanic check a car before you buy, pay an oil

man to check it out," he says.

Have him check the flue-gas temperature in the smoke stack leaving the heater. It should not go over 600 degrees F. after 20 to 30 minutes of operation. Have him also check the CO<sub>2</sub> content of the flue gases, Most servicemen have little chemical kits for doing this. Carbon-dioxide content should be no lower than 8½ percent, no higher than 14 percent. As for flame adjustment, look for a bright yellow flame with orange tips and no smoke.

Coal-burning systems. These go into fewer than five percent of new houses today but are in over six million existing

[Continued on page 242]





#### Underseat Heater for Hunter's Boat

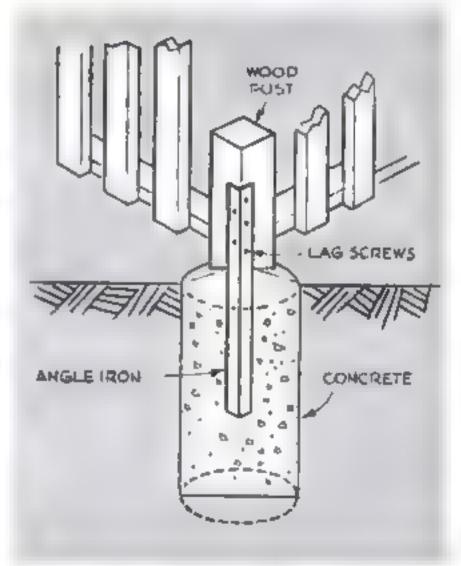
AN OLD gas-oven burner connected to a bottled-gas tank can take the chill out of long hours of sitting in a metal duck boat. Enclose the heater in an asbestos pipe cover large enough to allow 2" clearance around the burner and fasten it under the seat. Install a shutoff valve in the coppertubing line, and use only low flame settings.—Philip Barske, Stratford, Conn.

►►► To FIND that most-used key on my key chain quickly, even in the dark, I separated it from the others with a pair of small rubber grommets.—Dessie B. Jacknon, Berkeley, Cal.



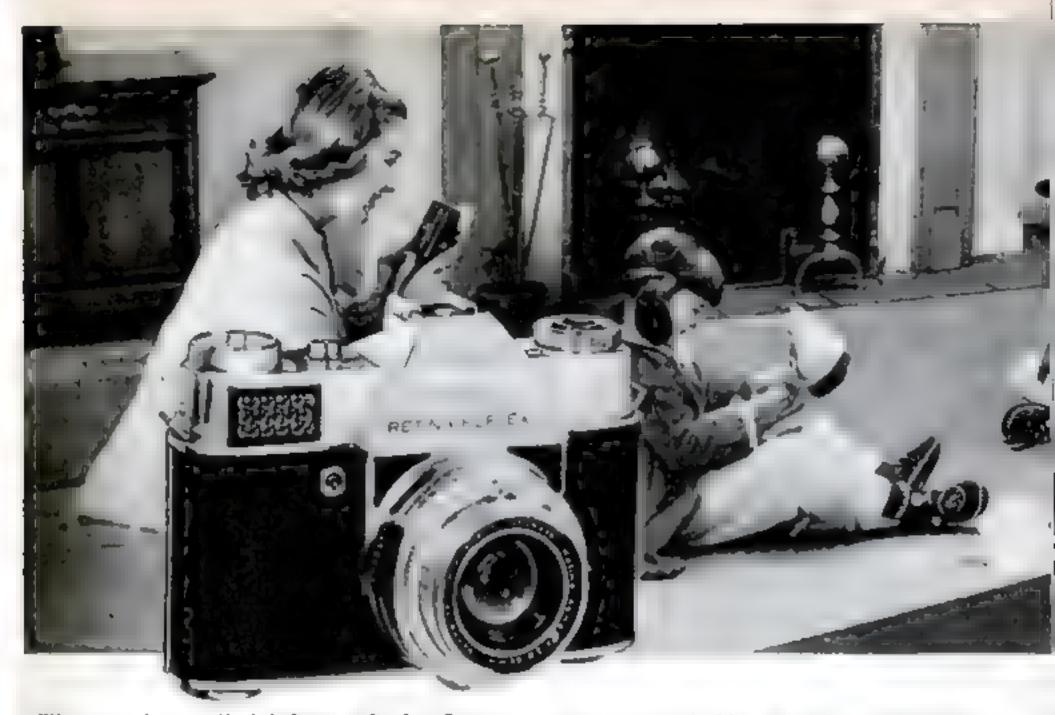
#### Salvaging a Broken Graduate

A GRADUATED measuring cup with a broken base can be restored to usefulness with epoxy putty. Set the graduate in a greased jar cover, then fill the cover with one of the new plastics. If necessary, you can make a temporary support for the graduate, using coat-hanger wire stuck in a block of wood. Bil Toman, Palatine, Ill.



#### Replaceable Fence Posts

ANGLE iron set in concrete simplifies replacement of fence posts. Two or more holes are drilled in each face of the exposed angle iron, and four-by-four wood posts are lag-screwed to the inside The holes are staggered to permit the screws to enter the wood from two sides without striking each other.

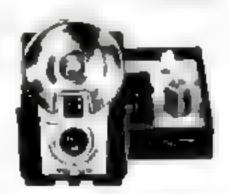


The superb new Kodak Retina Reflex S-makes you master of every picture-taking situation. Built-in light meter. Automatic

exposure control. View and focus through the lens. Accepts full family of lenses, 28mm to 135mm. With f, 2.8 lens, \$199.50.

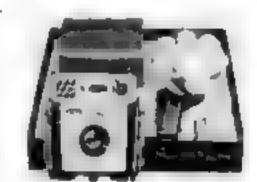
# Kodak suggests a Give

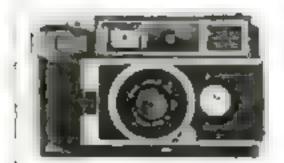
Give Kodak gifts for a happy Christmas!



Brownie Starflash Outfit - For snapshots and color slides! Includes built-in flasholder, bulbs, batteries, film. Only \$10.35.

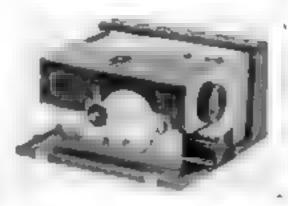
Brownie Starmatte Outfit—Electric eye sets the lens! Camera, field case, flasholder, bulbs, batteries, film. \$45.95.





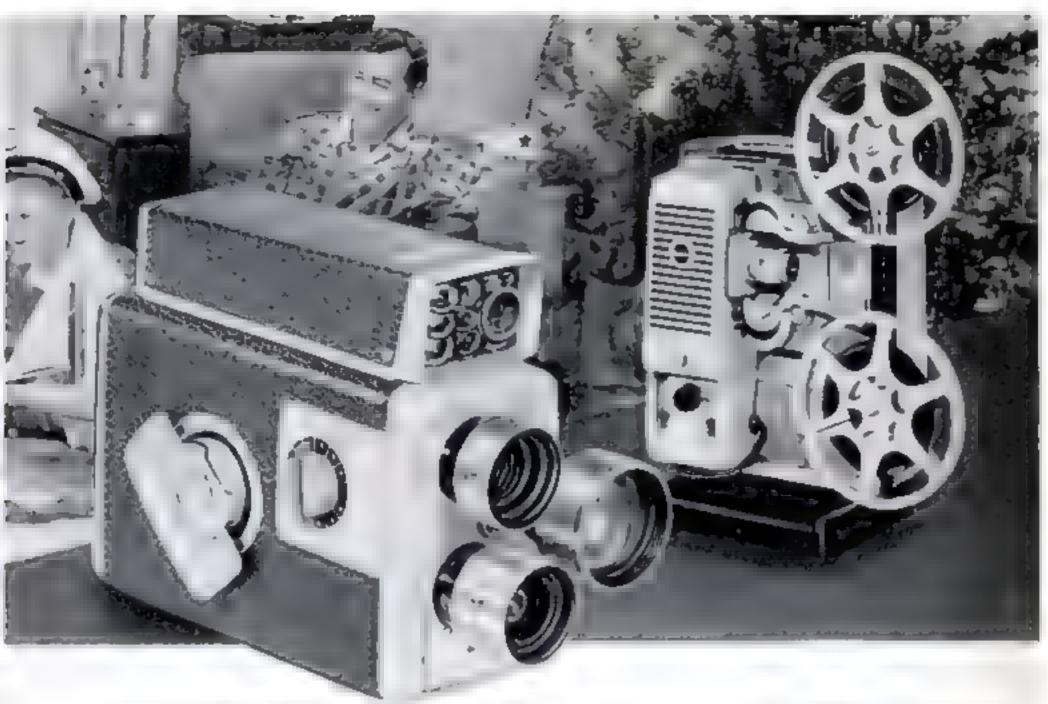
Kodak Signet 80 Camera—Fine 35mm, easy to use. Light meter, rangefinder, //2.8 lens. Accepts interchangeable lenses. \$129.50.

Kodak Cavalende Projector— Changes slides by uself! Turn it on, it does the rest. Model 510, with brightness control, \$159.50.



Many photo dealers offer terms as low as 10% down. Prices are list, include Federal Tax, and are subject to change unthout notice.

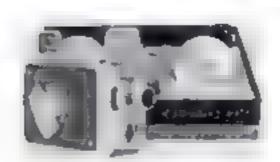
See Kodak's "The Ed Sullivan Show" and "The Adventures of Ozzie and Harriet"



The Kodak Cine Scopemeter Camera, Turret f/1.9, shows correct lens setting automatically. Built-in exposure meter, filters, three-lens range. Only \$99 50. 8mm Kodak Cine Showtime Projector threads itself all the way—automatically. Model A20, \$137.50.

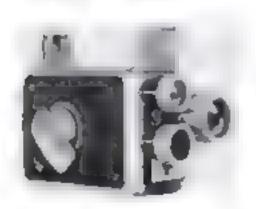
# and Take" Christmas

Take pictures to save and share the fun!



Brownie Movie Comera Kit, f/2.3—Color movies easy as anapshots. Complete with camera, light bar, lamps, titler board. \$39.95.

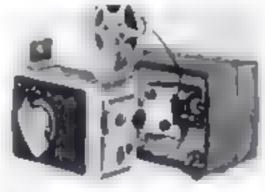
Brownie 8 Movie Outht—Includes Brownie Movie Camera, / 2-3, Brownie 8 Projector, plus 200-foot reel and can \$-8-25.

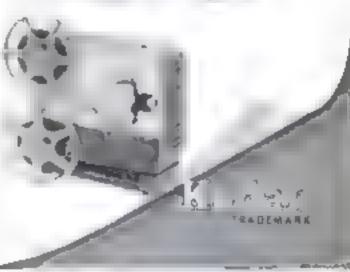


Brownie Movie Camera, Turret f 1.9 – Three-lens range at a 1-lens price. Takes normal, wide-angle, telephoto shots. \$67.50.

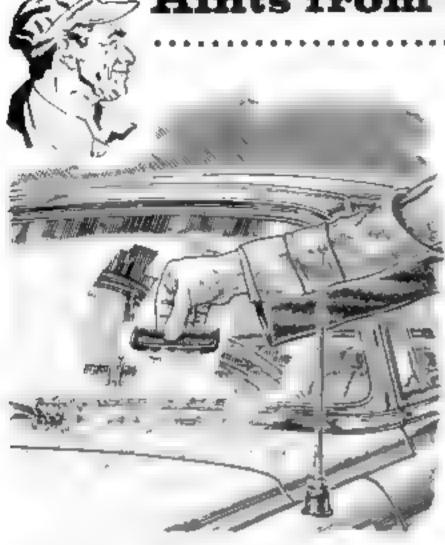
Brownie 500 Movie Projector— Most brilliant of Brownie projectors gives half-hour shows, reverses action, shows stills, \$79.50.

EASTMAN KODAK COMPANY, Rochester 4, N. Y.





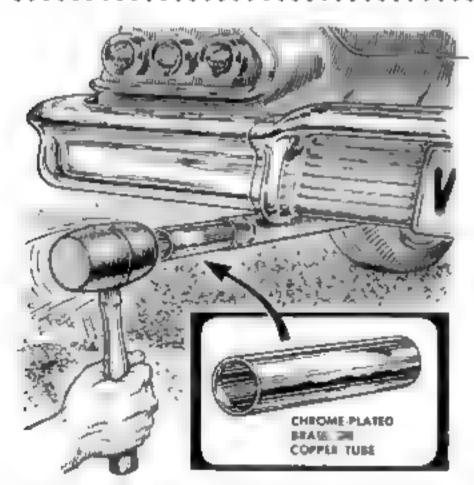
#### Hints from the Model Garage



A handy windshield scraper may lie right in your pocket—it's your comb. The smooth edge along the back of a plastic or hard-rubber comb will remove a light coating of ice or frost quickly, without scratching the windshield.



Carnishings of reflective tape on the outside of a car can be left to the jalopy set. Instead, stick the tape in inconspicuous places where it can be seen—and flash its warning to other cars—only when the hood or trunk lid is raised.



Rustproof tailpipe extensions that will outlast commercial chrome-over-steel extensions can be made from bathroom drainpipe. Get some chromed brass or copper pipe that will fit snugly, and drive it into the tailpipe with a soft hammer.



To keep dust out of an opened, partly used can of oil, automatic transmission fluid, or antifreeze, cover it with a larger can. A large fruit-juice can with its top completely cut off will fit just about right over a quart-size container.

# BOOST PERFORMANCE AND ECONOMY WITH CHARLES CARBURETOR CLEAN-OUT!



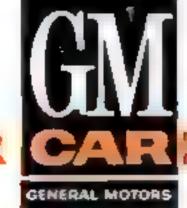
If top-quality service is your bostman, and your local UMS distributer about the Rechanter-OM Kleenout Kit. It's are of the many factory-approved service items in the fast-moving Rechester-OM In-lies Line.

#### AVAILABLE NOW AT YOUR NEARBY ROCHESTER-GM CARBURETOR SPECIALIST'S!

Here's the fast, economical way to keep your earburetor in perfect working condition. Have your nearby Rochester-GM Carburetor Specialist give your carburetor an on-the-car clean-out. This quick, simple operation removes gum, sludge and other deposits that rob you of mileage. In addition, this on-the-car clean-out includes replacement of vital parts plus a regular maintenance adjustment of your earburetor. This in-between-tune-ups procedure will save you money in the long run. It's quick and easy, and it keeps your car delivering top performance and economy. See your Rochester-GM Carburetor Specialist today.

Rochester Products Division of General Motors, Rochester, N. Y.

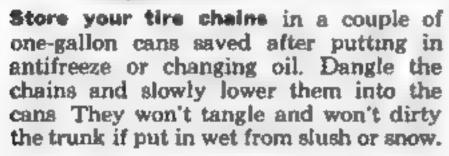
ROCHESTER

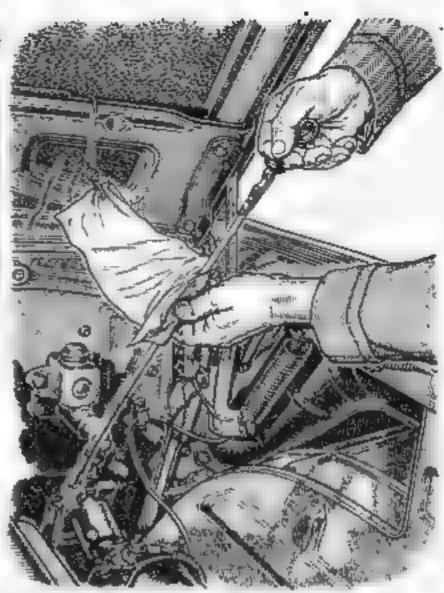


America's number one original equipment carburetors

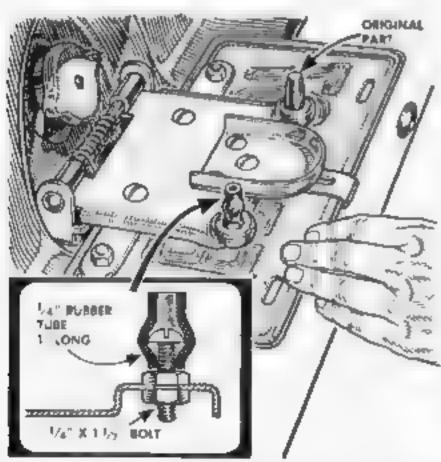
BURETORS



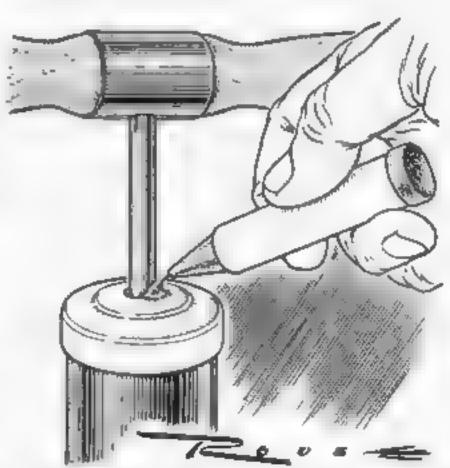




If you check your oil yourself, keep a small rag tied to the bracing under the hood. You'll find it handy for wiping the dipstick. Place the rag where it won't tangle with the fan or rest on a hot exhaust manifold when the hood is closed.



License-plate rattles caused by a lost rubber bumper on a swing-out bracket can be silenced with a 1" piece of wind-shield-wiper hose. Use two nuts to lock a ¼" bolt in the hole in the bracket, then slip the hose over the bolt head.



A tire pump that binds can be made to operate smoothly by squirting powdered graphite into the hole where the plunger enters the barrel. Even if excess graphite is pumped into the tire, it won't cause the rubber to deteriorate as oil would.

202 POPULAR SCIENCE DECEMBER 1959

# The most versatile saw you can own!

Porter-Cable
ELECTRIC HAND SAW
5-STAR TOOL

Actually 7 saws in one! Use it for hundreds of jobs—it's a rip saw, cross-cut, coping, key hole, scroll, jig, and hacksaw. And this Porter-Cable all-purpose saw gives you hairline accuracy because of these exclusive design features: comfortable top handle with on-off switch for positive control; auxiliary side handle for two-handed control on intricate cuts and in awkward positions; king-size base for stability; and a sawdust blower for constant clear visibility of cutting line.



Cut perfect circles quickly. Start with a plunge out and you can make a cutout in the center of a panel of almost any material. Do a professional job of contour cutling, cross-cutling, ripping, and fancy scrot work.



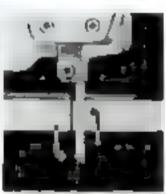
Slice 2 a 4's in 8 seconds flat! Metal, too—16" alsominum. 16" imail Cul sheet metal, bar stock pipe, woods, laminated prastics and compositions



Cel accurate angles up to 45" with exclusive angle base. Make inside cuts, without drilling starting hole and without blade breakage.



Saw plywood and laminates without shredding or chipping with patented Magic Circle Insert Disc Standard feature with every 152 Saw



Orbital-Action blade cuts
3 times faster lasts up to
30 times longer. Blade
moves forward only or
cutting stroke—pulls back
on non-cutting stroke

# Save \$10

10 place SAW KIT reg. \$59.95 NOW ONLY \$49.95

Limited Offert Kit Includes Model 152 Saw, handy wall bracket, angle base, rip guide, patented "Magic Circle" Insert disc, alien wrench, tube of grease, and 3 assorted blades, ORDER YOURS TODAY

UMITED OFFER! SEND NO MONEY!
ORDER YOUR HAND SAW KIT NOW!
TAKE 6 MONTHS TO PAY!



Porter-Cable Machine Co. 9158 Marcellus Street, Syracuse 4, N. Y.

I wish to order the tools checked below. I agree to pay my Porter-Cable Dealer full price or down payment indicated upon receipt of tool, and the balance in monthly installments shown below.

Model 152K

City & State-

\$49.95

Down Payment

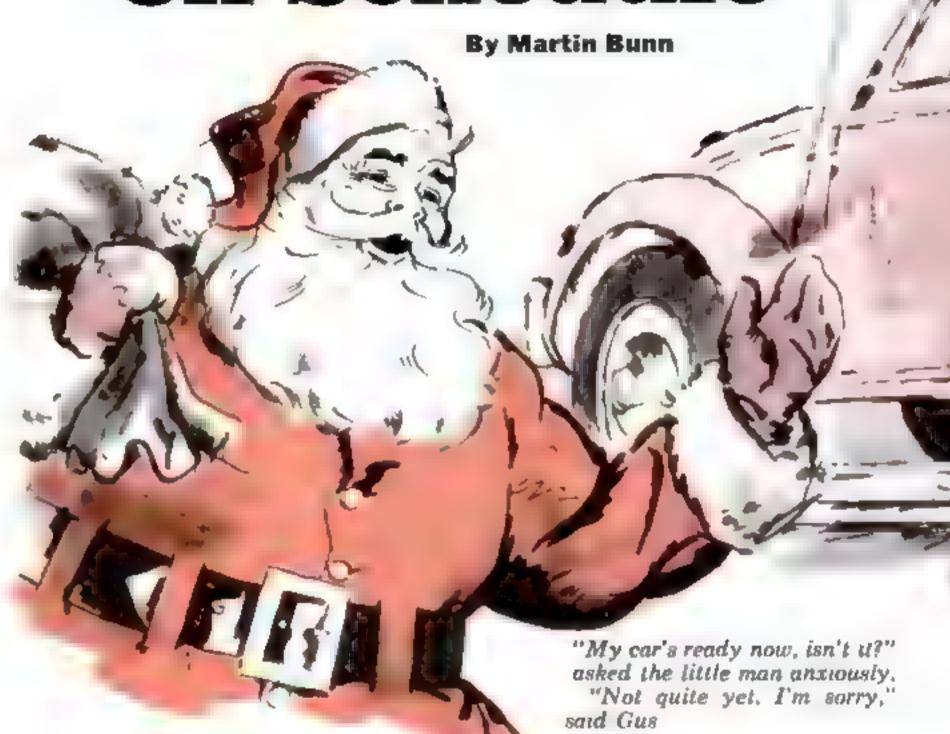
Balance Monthly for Six Months

\$7.95 \$7.50\* \*Includes service charge

This offer good only in U.S.A., Hawaii and Alaska, State and local taxes applicable. (Void where prohibited, license required or otherwise restricted.)

Address \_\_\_\_\_

# Gus Keeps Santa on Schedule



VITH a final tug on his thick white whiskers, Gus opened the door of the Model Garage office.

Surprise stopped him in midstep, for framed in the doorway was a shorter duplicate of himself—Santa suit, stocking cap, and all. For a confused moment Gus thought he'd walked up to a mirror

"Mr. Wilson?" asked the apparition. "My name is Olford. I shall be in town two hours and 14 minutes. Can you repair my car in that time?"

Gus looked from the cherubic, bewhiskered face to the garage floor. A small, air-cooled, rear-engine car of popular German make stood there.

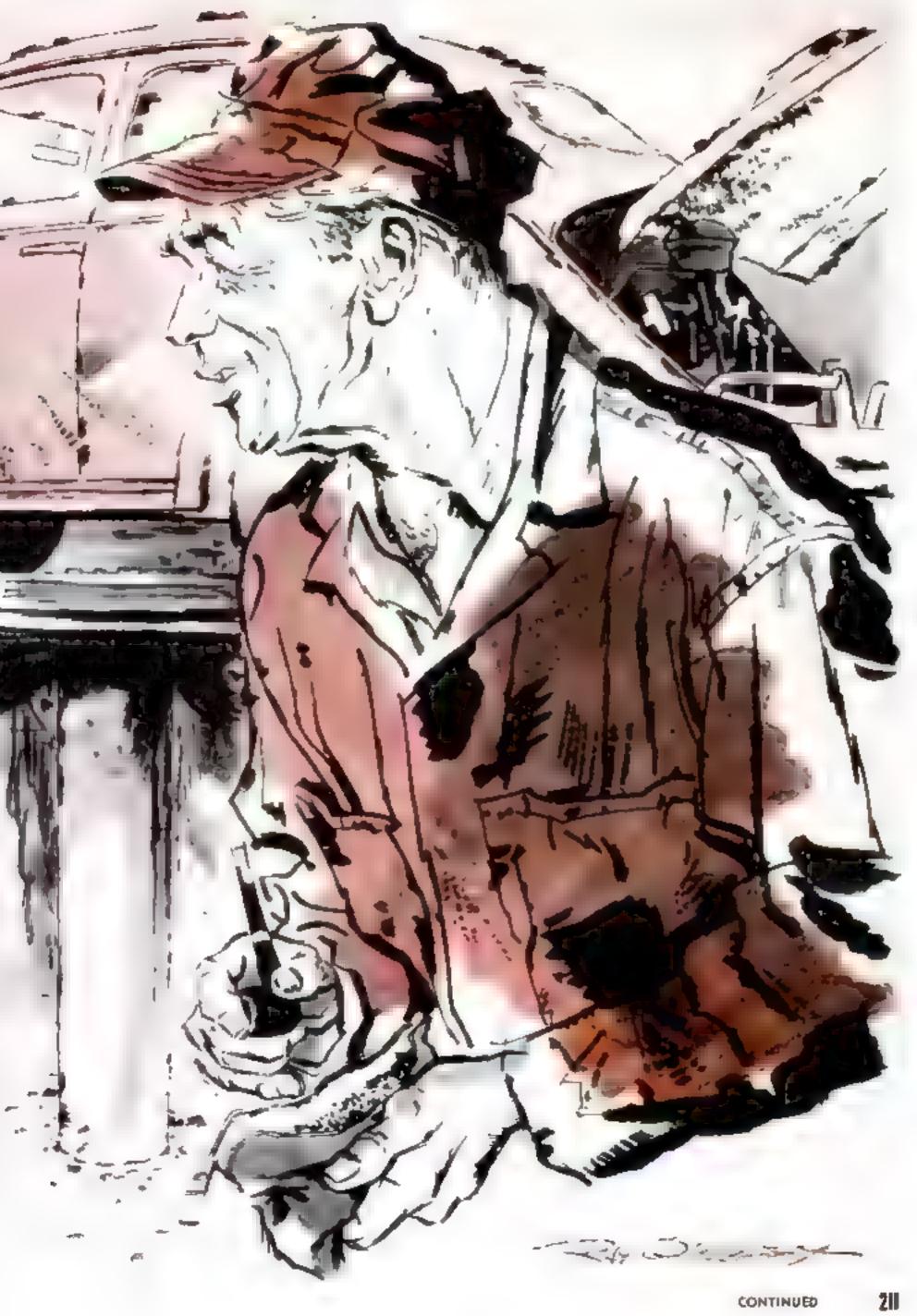
"I don't know," he said. "It's my day for playing Santa, too—at the grade school, I'll be out an hour or more. Maybe my helper can take care of it. Just what's wrong?"

"I am accountant for the trustees who operate the Anderson Home for Children in this community, and the Melville School 200 miles north. The man I hired as Saint Nicholas fell ill at the last moment. I'm taking his place,"

"I see," said Gus, "But your car, ..."
"Oil failure, sir, oil failure, I've drafted a tight schedule that will allow me to appear at both institutions. Wearing this costume on the trip, for instance, nets me 20 minutes. But unless you can remedy the situation, I may have to abandon my visit to Melville."

"How does this oil failure show?" asked Stan, whom Gus had called over.

"The green low-pressure warning light





## The PROOF is on your dipstick

See for yourself! If your oil shows dirty before it should-you'd better change to Hastings. Hastings Oil Filter Cartridges keep oil clean from filter change to filter change, when replaced as normally recommended. This is proved by tests conducted in secordance with U. S. Bureau of Standards.

Here's the reason: Only Hastings has DENSITE filtering material. Millions of selected, pressurepacked cotton fibres trap and hold even the most microscopic dirt particles. Your dipstick will prove it!

The next time you change oil, change your filter, too-and be sure it's Hastings, the filter cartridge that assures clean oil-less engine wear and subsequent repair bills-as no other filter can. Yet Hastings Cartridges cost no more.



U. S. Patent Nos. 2,797,811, 2,584,771

HASTINGS MANUFACTURING COMPANY HASTINGS, MICHIGAN. · Oil Fitters, Piston Rings, Casite, Spark Plugs becomes luminous at any speed over 40," said Olford. "When it first happened weeks ago, the dealer installed a new pressure switch. But I have not driven fast since then, until today, when the same thing occurred. Unless I can hold 60 on the throughway, I shall arrive after the children's bedtime."

"We'll see what we can do, Mr. Olford," promised Gus, and the smaller Santa bustled off to call a taxi.

"I'll hop to it," said Stan. "Say, how about that favor I asked for? You going to wear that red suit for my nephews?"

"I'll lend you the suit," said Gus. "I'm not cut out for Santa. I'd never fool those kids. Gus, look-will you take

a bet?" "A bet on what?" asked Gus warily. "You know how things come in threes.

If three of these foreign jobs come in today, will you do my play-acting?"

Gus chuckled, "On Christmas Eve? Stan, you're on. And now I'm off."

THE first thing Gus saw in the shop when he returned from the grade school was a little French rear-engine sedan. Donning shop clothes, he went back to the hoist on which Stan had raised Olford's car. The young helper was plainly puzzled

"There's plenty of oil. The crankcase screen is clean. The wrench marks on the new switch are still fresh. If it were a leaky oil line, you'd have low pressure at low speeds more likely than at high."

"Check for a short in the warning circuit," suggested Gus, "The trouble may not be what it seems. And say—what's that French sedan doing here?"

"That? Oh, it's in for a check of the generator and voltage regulator,"

"Doesn't it belong to the new highschool teacher who boards near you?"

"Yeah. The standard battery didn't stay charged after he put in a radio and the weather turned cold. He drives a lot of stop-and-go. So he put in a new 115-amp battery. Now that falls off, too."

Looking at Stan's too-innocent face, Gus had a notion that he was being hoodwinked. It stayed with him as he went back into the office. With year's end approaching, there was paperwork to get rid of. Gus sighed as his pencil bit into inventory figures.

FIRE!" Stan's voice managed to crescendo on the single word, "Fire!"

Gus ran out to find Stan tearing at the hood of the French car. As he flung it back, greasy white smoke boiled out. Stan streaked for an extinguisher. Gus grabbed a bolt cutter, hooked its jaws over the battery ground cable, and bit through. A squirt of carbon dioxide quenched the flames.

"Just as well this is the luggage compartment," panted Stan, "and the engine

is at the other end."

"A little paint and the grease on the battery terminal burned," said Gus. "The fire did your job for you."

"How's that?"

"Find out how it started, and maybe you won't have to check the generator and regulator at all. I'll look at Olford's car meanwhile."

BUT Gus soon felt he had taken on a brain buster. As Stan had said, the oil and screen were in good shape. There was no sign of a short in as much of the wiring as Gus traced before Stan came over.

"You were right," Stan reported. "The hot terminal of that oversized battery sat almost on top of the hold-down strap. When corrosion formed, current began to short across it from the terminal to the ground strap."

Gus nodded. "The battery was being

drained just standing still."

"Uh-huh. More corrosion, more leakage, until it got strong enough to start that fire. I cut a notch in the strap next to the terminal to give it room, and put on a new ground cable."

"Sounds okay," approved Gus. "But

this job still stumps me."

"I guess, like you said, it just isn't what it seems," muttered Stan.

Gus looked up. "Could be," he said, "that it's not oil, but air."

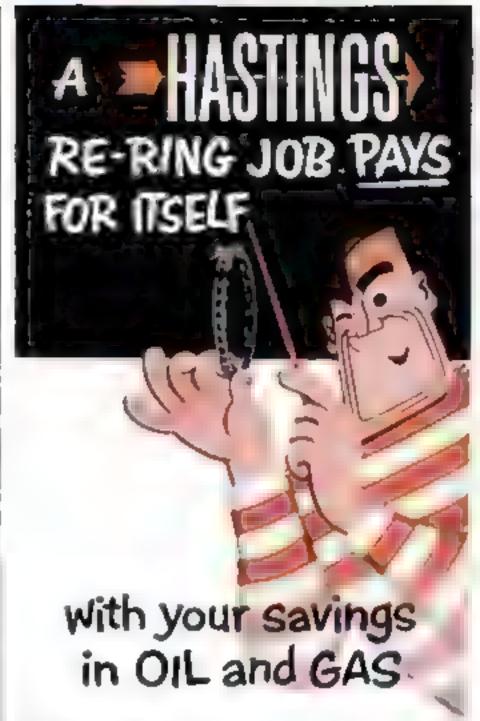
"Air in the oil line?"

"No, cooling air. If this mill overheats, the oil can get thin enough to trip the low-pressure warning. Now how could the air fail? This belt drives the generator and blower, both on the same shaft. But it's tight."

"And if it were slipping," Stan pointed out, "you'd get a no-charge signal from

the generator circuit."

Brooding over the problem, Gus began



Don't put up with poor performance and big oil and gas bills just because your car's no longer new. You can restore its lost pep and power and prevent excessive oil and gas consumption, with

a Hastings re-ring job.

The sooner you act, the less it will cost. See your motor specialist the minute oil-pumping warns you there's trouble shead. When he says you need new piston rings be sure you get Hastings. They're engineered exclusively for replacement service . . . to provide the additional lubrication worn engines need . . . to stop oil-pumping, save gasoline, restore lost performance.

Get new car power and performance from your present car—with Hastings. Truly your best investment for many thousands of extra

miles of trouble-free driving pleasure.



to fill his pipe. Outside, a taxi screeched to a stop. Olford entered, his cheeks as red as his suit.

"It went famously—famously. The children enjoyed it enormously. My car's ready now, is it not?"

"Not quite yet. I'm sorry," said Gus.

"Well, there is no point in arriving at Melville tardily; the children will have been sent to bed. I had best telephone

and cancel my projected visit."

Visibly dejected, the little man walked away. Gus tried to remember all he knew about the German car's cooling system. Wasn't there a thermostatic bellows linked to a hinged throat that controlled air intake? Suppose the bellows had collapsed or exploded?

Grabbing a drop light, Gus raised the



car enough to peer into the right-hand heater duct. Well forward, he could just make out the beliews. It looked its normal, shrunken, cool size. Clapping an exhaust hose over each of the twin tailpipes, Gus started the engine. After a short time he again peered into the air duct. The bellows was well expanded.

"Thermosat works," muttered Gus. 
"Could be the linkage." With the engine off, he reached forward around the blower casing, feeling for the intake throat. Instead, his hand encountered a flappy substance that gave at his touch.

"Stan!" he roared. "Tell Mr. Olford to

cancel that call "

FROM the workbench Gus chose a couple of sheet-metal screws and washers. Humming softly, he drove the

screws into the firewall forward of the engine, then shut the compartment.

"Have you conquered the trouble?" asked Olford as he came bustling up.

"Yes. You can drive fast now."

Olford mopped his face with a large handkerchief, "I'm delighted—delighted. I believe I would have been as disappointed as the children." Stuffing away the handkerchief, he pulled out a watch. "Yes, I can still make it."

Briskly the little accountant paid Gus's modest bill, hopped into his car, and drove away. Stan looked after him curiously. "You didn't road-test his car, Boss. How come you're sure?"

"When I felt around to see whether the linkage was connected," explained Gus, "I found the insulation had fallen

off the firewall. It was blocking the air intake. At high speeds, the engine didn't get enough air. It overheated and thinned out the oil. All I did was refasten the loose insulation."

Stan nodded absent-mindedly. Just as he was about to close the door, a small English sedan rolled in.

"Oh no!" groaned Gus, "Mrs. Larkin!"

The woman looked coyly at Stan, "This young man told me for weeks that I should get new plugs before going on my Christmas trip. Today he even telephoned to remind me . . ."

Stan was taken with an uncontrollable coughing spell. He was nowhere in sight as Gus, after ushering Mrs. Larkin out, went back into his office. When Gus came out again 10 minutes later, Stan was just closing the hood of her car, with four old plugs in one hand and a troubled face that brightened suddenly.

"Gus! You're going to play Santa for

my nephews after I . . . ."

Once more paunchy and bewhiskered, Gus grinned at his helper. "After you framed me by wangling two more jobs on foreign cars, right after Olford's."

"You -you're not mad then?"

Gus chuckled. "You'd have talked me into it anyway, Stan. Haven't you just proved twice over that you're an allfired powerful salesman?"

Next Month: Gus thaws a frosen driver.

BIG REASON WHY AC "MUST BE THE BEST"!

# NEW EXTRUDED SHELL GIVES 50% GREATER STRENGTH



AC Engineers have done it again!

First for 51 years in pioneering spark plug advancements, AC now introduces the process of cold extrusion for producing superior spark plug shells.

A giant 200-ton press forces blanks of steel through a die Shells emerge ready for machining, threading and assembly into quality spark plugs.

What's the point? Metal has "flow lines" just like grain in wood. No longer do bar-stock machines cut across longitudinal flow lines and "shave against the grain" of the metal. No longer is metal weakened because of a flow line cut.

Cold extrusion by mighty presses bends the steel's flow lines to the shape of the die. Original strength of the steel is preserved.

That means AC spark plug shells are 50% stronger: still another reason why AC Fire-Ring Spark Plugs MUST BE THE BEST!

AC SPARK PLUG 🚜 THE ELECTRONICS DIVISION OF GENERAL MOTORS

These great lines follow the excellent flow lines that account for the 50% greater strength of AC Spark Plug shells.

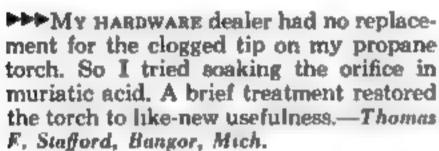


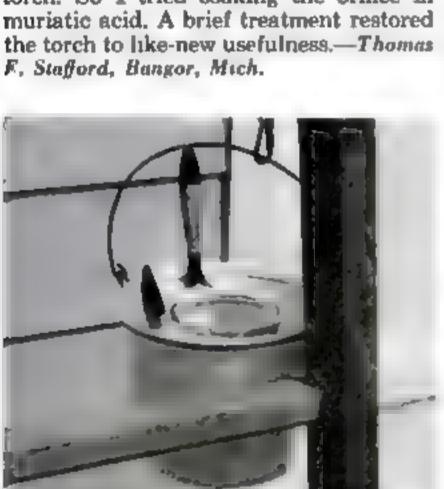
AC Fire-Ring Spark Plugs

# Short Cuts

#### Twin Baskets to Save Steps

To solve the problem of innumerable trips up and down stairs to replace toys, shoes, etc., that belong at opposite ends of the stairs, simply spray two bushel baskets with paint to match your decor. Keep one as a catchall at each end of the stairs. When they're full. switch the two-and simplify your "putting away" chores by making only one trip. - Mary Lou Miller, Huntington, Pa.



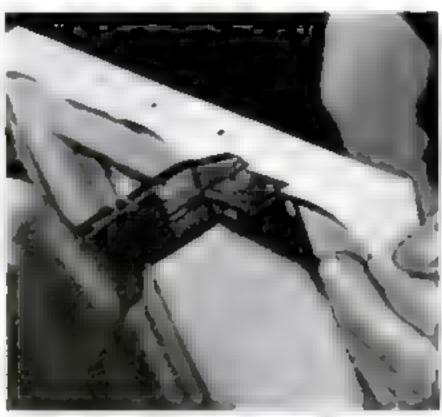


**Holding Two Brushes** 

A SIMPLE way to handle two brushes is to stand them upright in the space between a quart paint can and the inside of a gallon bucket. Paint from the brushes will drain off into the bottom of the pail. Protect the can with a foil wrapping.— W. K. Edwards, Springfield, Ill.



>>> WHEN using a drill on polished surfaces, keep it from skidding by making the centerpunch mark in a piece of masking tape over the point to be drilled. The tape will hold the bit steady for a good start.—Edward Bentley, Jackson, Mich.



Wide-Jaw Pliers from Hinges

STRETCHING soft materials for tacking can be made easier with a flat cabinet hinge. Grip the hinge in ordinary pliers to extend the pressure over a wide area and lessen the danger of tearing the fabric before it's tacked in place.— Michael Ligocki, Gary, Ind.



#### Detachable Mounts for Flower Box

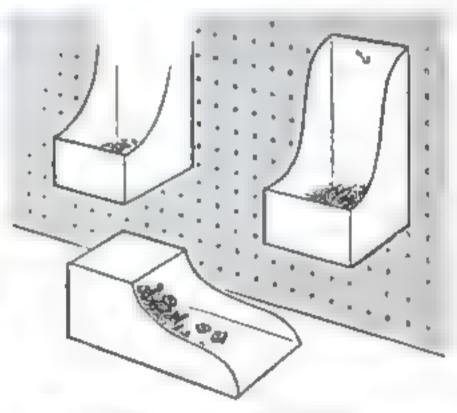
This system of hanging a flower box permits easy removal for painting. The only addition to the building is a pair (or more) of lag screws, projecting from the wall, and firmly anchored in the building's frame. The strap-iron brackets have inverted keyhole-shaped openings which slip over the projecting screwheads. In place, the box conceals its metal supports.—E. W. Kraft, West Chicago.



#### **Hanging Heavy Objects**

Heavy mounted trophies, mirrors, pictures, or the like can be hung from stout nails or screws in the wall. Screw a corner mending plate to the back of the frame or mounting board, after first drilling a recess for the mounting screw.—

Howard Miller, Bartley, W. Va.



#### **Milk Cartons Store Nails**

Wall bins for nails of various sizes can be made from discarded milk containers. Cut them to the shape shown and hang them on nails driven into the wall. Nails are easy to pick out when the bins are taken down and placed flat on the bench.

—G. E. Hendrickson, Argyle, Wis.

[Continued from page 98]

tiac engines. He and his crew reworked them to increase their displacement to 434 cu, in, and compression to 13:1.

Leaving the bore at 4 1/16 inches, they increased the stroke to 4½ inches. They added fuel injection to each engine, installed roller camshafts, and put in magnetos in place of distributors. They installed high-compression pistons and specially ground chrome crankshafts.

To achieve supercharging, they cut five nostrils in the car's snout. Air ramming through those holes builds up enough "cabin pressure" around the engines to provide sea-level carburetion at the lofty altitude of Bonneville.

And yet more power. As a final fillip, Mobil brewed an experimental fuel for Challenger I. A mixture of pump gasoline, various alcohols and nitrated fuels, it is claimed to add 50 hp. apiece to the engines at full throttle.

At maximum speed, the engines churn at 5,800 to 6,000 r.p.m. and kick out 500 hp. apiece.

The engines were laid out in pairs, hooked up to 1948 Cadillac transmissions.

There are no connections between the pairs of engines except mechanical gearshift linkage and hydraulic throttle linkage. Thompson rigged up two long arms of pear-shaped tubing, moved by handles in the cockpit, to shift all four transmissions simultaneously. One arm is for low gear; the other for second and high.

The left-front and right-rear engines turn counterclockwise, to keep all the torque pulling toward the center.

The front engines drive the front wheels, the back pair the rear ones. The wheels are locked together, so that if one engine of a pair should fly to pieces, the other would keep them turning evenly.

Since no wheel has been permitted to run free, there was no need for spider gears. The differential housings contain ring, pinion, and quick-change gears, like Indianapolis cars.

It was obvious to Thompson that at the speeds at which he aimed to travel, the ring gears and pinions would be gnashed into metal chowder unless he somehow reduced the tooth velocities. So he devised small overdrive units, mounted between the differential housings and the wheels. The overdrive gears are made of heavy steel, like the quick-change gears. The overall drive ratio is 1.3:1.

This earthbound missile was then clothed in 576 square feet of well-tailored aluminum, including a windowed canopy.

Parachute brakes. To stop his alim, low speedster after a plunge across the salt flats, Thompson uses a combination of drag chutes and brakes. A pair of six-foot ribbon parachutes on the end of a 50-foot lanyard, shot out a rear tube by an explosive charge, haul the streamlmer back to safe braking speed. When the car has slowed to 70-80 m.p.h., cast-aluminum finned drum brakes, controlled by a lever in the cockpit, are applied.

At first, Thompson used a single drag chute on a 25-foot line. But when he tried this at 332 m.p.h., the turbulence in the wake of the hurtling car whipped and whirled the chute violently. Challenger I was slewed into terrifying 800-foot quarter-broadsides for a distance of two miles.

Shaken by this experience, Thompson decided he'd try two chutes on a lanyard twice as long. The experts said that wouldn't work. Thompson insisted. And his instinctive engineering judgment proved to be right.

When he tried them out, they worked perfectly. "It felt just the way it does in an airliner when the pilot reverses the props," he reported.

The car, which has no starter, has to be pushed to 80 m.p.h. before it fires. The engines then take hold with a thunderous belch. At full throttle, though, they hum a high-pitched tune. The car shifts into

Unseasonably early fall rains this year, softening the pavement-hard surface of the salt flats, spoiled Thompson's efforts to beat Cobb's land-speed record. He had to be satisfied with 367 83 m.p.h.

second at 210 m p.h., into high at 315!

What is it like to cover the ground that fast?

"It's like trying to follow a road that is disappearing over the edge of the world," Thompson says.

And how does Mrs. Thompson, a young mother of two appealing youngsters, feel about her husband's obsession with speed?

"It's fine with me," declares Judy Thompson. "I've always said that if Mickey were a flagpole sitter, I'd be right up on a pole alongside."

# Merry Christmas (with a big \$21\omega saving) from DELTA

to YOU!

Take advantage of Delta's holiday gift to you—a \$21.00 saving on the most popular home workshop power tool made! And whether you plan to play Santa for yourself, or just be plain surprised when your Christmas "wish" comes true, you'll start with the finest when you get this famous Delta 9" Tilting Arbor Circular Saw.

Now—just in time for gift giving (or getting)—your Delta Dealer will give you a \$21.00 trade-in allowance for your old hand saw (any kind, regardless of condition) toward the purchase of a new Delta 9" Circular Saw. You'll get a lifetime of safe, accurate, dependable performance (along with lots of fun and satisfaction) when you own a Delta Saw—it's backed by over 30 years of engineering skill and experience. Why be satisfied with anything less?

Visit your Delta Dealer (he's listed under "TOOLS" in the Yellow Pages) or take your saw to leading Department, Hardware or Building Supply Stores. Go alone, or with your own "Santa," but don't miss this opportunity! Rockwell Manufacturing Co., Delta Power Tool Division, 504M N. Lexington Ave., Pittsburgh 8, Pa.

Own the finest right from the start—
and at a big \$2100 SAVING
(slightly higher in the West)

Cat. No. 34-004 Delta Homecraft 9" Tilting Arbor Circular Saw

another fine product by CROCKWELL



It is a wise choice to give work saving power tools at Christmas because any man will appreciate them. And it is a wiser choice to give Weller Tools because their fine quality and advanced features mean dependable performance.



Makes sanding easy. Fast, too with big 25 sq in sanding surface and 14,400 strokes a minute. Straight line action—never bucks, twists or scars wood—gets into corners. Low design—gets under low places. Fin gertip "on-off" control Easy sandpaper replacement Assorted sandpaper and polishing cloth included

MODEL \$1695

A so available in Metal Kit Model 700K, \$18.95 Makes every kind of cut through plywood, composition board, aluminum, etc. Even makes its own starting hole for inside cuts. And it's portable—use it anywhere Exclusive strain-relief design eliminates blade breakage Hammer tone finish aluminum housing. Two wood cut ting blades and metal cut ting blade included.

MODEL \$1995

All Welfer Power Tools are guaranteed for 1 year

DESCRIPTION OF THE PERSON NAMED IN COLUMN

Features the new Weller Dual Heat Gun Not only does heat and spotlight come on instantly when you pull the trigger—but 2 trigger positions give 2 temperatures at tip for more accurate soldering. First position gives low 90-watt heat, Second gives high 125-watt heat Soldering aid, cleaning brush and solder included

MODEL \$795

Heavy Duty Soldering Kit Model 8250AK, \$14.95

Walter Specials 1

#### ALARAMA

Birmingham
Homewood Paint & Hdwe.
Co., inc.
Star Hdwe. & Sep. Co.
Montgomery
Perker Sledge Hdwg, Stares

#### ARKANSAS

Alf Link-A-Way Stores

#### CALIFORNIA

**Butt** Lumber ABUZE Culver City Botts-Sine Lumber Co. Steller & Skoog El Segundo El Segundo Hides Fresha Walter Evde Co. Qi endale Glendalp Hohre. Larkspur Jim Corbett Home Craftsman s Store Let Angeles Calsahan Howe Midway Helws Co. s Gatos Los Gatos Haws. Fempleman Haws. Les Gates Mailby Beach Mailby Lumber Co. Mento Fack Mento Fack Hawe- Co. Millbree Military Makes. Haps Heinke & Gerns Bullding Sup. Moreoth Harold's and Chuck's Howe

Palo A to Palo Alte Ndwy.
Peninsula Miwe.
Piremount
Feed W Ehrmann Miwe.
Pakadana Berg Hdws.
Methodo Beach Griffin Miwe.
Redondo Hdws.
Garramenta Emigh Hdws Co.
San Bernardino
Stembridge Midws
Ban Bruno C & S Sevital & Sap.

San Francisco Charles Brown & Sons James Byrne Co. The Emperium Popenhausen West Perial Hows

San Ma ar

Quodinan Buildere Emporium
Fanta Crus Eastaide HoweBanta Monica Leo Rose HoweBuniand Roscoe HoweBuniand Roscoe HoweVan NuyNelman-Reed Custor CoVanice Lincoln HoweAll Dismend Gardner Retail

#### COLORADO

Stores

Aurora Malwe & Peint Co.
Brait Lumber Co
Benver AAA Howe Fac.
Aragehoe Mowe & App.
Brentwood Paint & Sup.
Clark's Nowe
Denver Dry Goods
Failty &
Franklin Howe Co.
General Mowe
Jaman Mowe
Maragick & Mowe & App.
University Milis Mowe

#### CONNECTICUT

All Carible Hardware Stores

#### DELAWARE

Elemets . . . H. H. Ulmer Wilmington Wilmington Hidwe.

#### DISTRICT OF COLUMBIA

Washington J Front Campbell Brent Palet & Ndws. Megnetian's Move All Feoples Hardware Stores

#### FLORIDA

Oade City Dade City Hidne.

Jacksonville
All Towers Hidne. Co Stores
Mr. Priersburg
Mervill Hidne Co.
Tampa Tampa Hidne Co.

#### GEORGIA

Atlanta
Ali King Hardware Stores
Rich's Inc.
Decatur
Clubs Idwe, A Hebby, Inc.
Smith Hdwe,
Macletts
Fair Onics Paint & Hebry. Co.
Smyras
Home & Nobby Sheet, Inc.
Waynesbore.
McKingey Wholesale Co., Inc.

#### IDANO

All Coast-to-Coast Stores

#### ILLINOIS

Alton. Their Habes Arlington Heights Hill Behan Lumber Co. Chicago Clark & Barlow Home. Co. Czer Home Fred Rubling Fred Runting
Mightand Mighte,
Millimenter Lamber Co.
Lind Move. E Supply Co.
M. A. M. Hardware Inc.
Mill. Greenwood Hifter,
Schultz Hohre. E Feliat
Stehhias Hohre. Co.
Steve & Mowe.
Wirbeidt Stores, Inc. Downers Grave Moche & Sen East 51 Louis Aubschom & Soms House. Evansten Wieboter Stores, Inc. Forest Park Peasing Hitter Qien Ellym Soukup Hdwe Yaughan and Wilde Glenview. Prospect Busse Biermann Co. Wille Lumber & Fuel North Aurora Hill-Behan Lumber Co.

Dak surn
Bedford Kinctric & Hdwe
Dak Park Wiebuidt Stores Inc
Palatine Hansen Indee
Peorla Fritch Hdwe
West Chicago Hdwe
Westenn Sankup Hdwe

MASSACHUSETTS

Alf W E Aubechen Co., Inc., Stores All Cartisle House, Stores

#### MICHIGAN

Detroit

A L Dammas Hdwe &
Stores
J. L. Hudson Dept. Store, Co.
Grand Rapids
Godwin Paint & Howe,
Filet
Cee. W Hubbard Hdwe.
Pentiac
F. J. Poole Hdwa. Stores

#### MINNESOTA

Minnespolis Warner Many
All Coast-Eq-Coast Stores
All Damble-Skingmo Stores
All Our Own Jidwa Stores

#### MISSOURI

Clayton Clayton Nowe.
Overland Anth Howe.
St Ann St Ann Howe.
St Charles Brucker Howe.
St Louis All Central Nowe Co. Stores Gene's Howe.
Glass Howe.
Globe Drugs

Lemay Ferry Milwe. Ph. Hips Merc Co. Alvertiete Hille. Tremann-Halmann Highes.

# Weller Power Tools are Featured at These and Other Fine Stores

Wheeling

Foor Howe. Inc. Millen Howe Co.

#### INDIANA

Hammond Bildon Paint & Sup. Ind inapolis Vonnesul Howe. Co. South Send Q E Meyer Howe

#### HOWA

Dea Molnes. Form & Home Hore Wilson Remai & Howe.

#### KENTUCKY

Laurente Chron Hawe-Sam Kohn & Sons St. Mainews Howe.

#### LOVISIANA

Atglers Sadern Howe New Orleans Airline Howe Carey & Helwick Inc Doucet Brothers Howe Harry's Howe Trayer & Heat Inc. Bhreveport Sucheley Howe Co.

#### MARYLAND

Estimore & Bauer mu-t. H. Cranston & Sons. Inc. Fisher's Howe & Paint Constantor's Home Dethesda Straumder's Home. . J. Alban Shelr Catonsville Golfege Park Golfege Park Heims. Buridalk N & W Super Market Hawa. Dept I difference West Hewe. Elition Sup. Co. Cikton. Renaington Bob's Home., Inc. Landover BIH & Hdwg Long by Park Murray Howe-Frank's Howe. Mt. Washington Howe & Paint Company Potemac

Potential Potential Rep. Co.
Silver Sovings
Morray Howe Co.
Woodmore Paint and Nowe.
Westminister D S Cohe S Son
Wheaton Pendleton Howe.
Wheaton Paint & Howe.
All Howe Fair Stores

#### MONTANA

All Coast-to-Coast Maret

#### **NEW KAMPSHIRE**

Ari W E Astruction Co. Inc. Scores

#### NEW JERSEY

Camden Carren Howe Elazabeth CHY Hall Move HILL Charge Marvey J. Yeger Jersey City Handy #dwe. Rearny. Marris Hdwe. Livenston Midwa, Contor Orange Vasley Neme, Orange Paraerus. Tooltown Howe, and See, Co.

Paterson Garden State Sup. Union Weber Mews.

#### NEW YORK

Amsterdam ... John E Larrabor Co.
Brecklyn Fax and Schame! Inc.
Sid's Howe Co. Inc.
How York Canal Howe. Co.
Murray Hill Howe. Co. Inc.

#### NORTH CAROLINA

Greeniture
McKnight Høwer, Inc.
Refersh
Village Indire. & Sports Store
Inc.
Wintton-Salem Physicals Howe.

#### 04110

Lyman Hewkins Lumber Co. Ted's Howe

Akres

Checonate Hader Howe. Stores Stollito's Idare. Dept Garage Store Cleveland Riverside Name. Co. Torch Hades. Acker's Idare. Columbus Acker's Idare. Clinton Edwe Conagan Name Conagan Name Hausch Bros. Helwe. Behreiser Hawe. A Physiologica. Co. Dayton Threckmortows, Inc. Lahewood The Service Hawe. Maple Heights Hair Advance Maine. A Paint Maple Heights Hair Parms Mane.

The Shaker Heights Howe. Co.

Shaker Heights

To edo Hampy Hows.
McElbeney Hows.
Air Cussins and Fearns Stores.
Alt Moore Biores
Air Zettier Stores

#### DICLAHOMA

All Qtasco Stores

Miristol

York

#### OREGON

All Count-to-Coast Stores

#### PENNSYLVANIA

Woler's

Constance Reine Name.

Harrisburg Fomeroy's Lev flown Levittewn Hawe.

Pomeroy's Inc.

Marcus Hook General Store

Marcus Hook General Store

Newton Square

Nowton Square Name. Co.

Phi ade phia.

Academy Paint & Nows.

Assen Hawe.

Murja App eten Co.

Hattanat Hawe. Co.

Phoen zwille

Shanaman's Home Builder

Drugstment Store

Read of J. W Leiback Hawe.

Winter Hawe Co.

Reyerstord Hawe Co.

#### SOUTH CAROLINA

Strattors Stratford Howe, Warminster Welshach's Howe

Walf Sup Company

Charleston Micosl's Haws Co. Cotunitia Hiller House, Co. Auth Habre, Co.

#### TENMESSEE

Chritisnoga Milise Bros. Co. Knesyl ie Catlowny-Farmer Mdre. Memphia Whisten Bros. Ndws. Muriressboro Ndws. Co.

#### TEXAS

Dailes C. S. Hdwe. Stores
Fort Worth Leonard's
Houston American Ndws.
David s Hdwe Co
Farmers Gos & Hdws,
Folcy's
HAM's General Ndws,
D'Gr re Hdwe
Wagner Hdwe Stores
Passdens Techer Ndws Els
Sen Antonio Jaske's of Texas

#### UTAH

Ball Lake City Refehem's Bab Mulholt and Mdwe. Book Nowe. Blandard Ballders Sup. Co. State Hows. 2 C. M. L. Bopt. Store

#### VERMONT

All W E Autuction Co., Inc.

#### AIMIDMIV

Allegton Aclington Howe, Concrydale Hows
Fairles Fairles Hows Co.
Nortolk Lum's Hows Corp.
Portamouth Standard Hows. Corp.
Richmond A L torraine Hows. Co.
Westwood Hows.

#### WASHINGTON

Bremerion Yodd Hidwe.
Burles Burles Hidwe.
Seattle Grondway Hidwe.
Pacific Goest Hidwe.
All Coest-to-Cener Stores

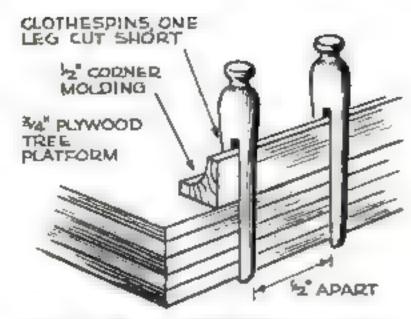
#### WEST VINGINIA

Huntington
Gibert & Company Howe.
Parkersturg Ren's Howe.
South Charleston
Town & Country Howe.
Wheeting H Kalbitzer & Son

#### WISCONSIN

Cadeby
Cadeby
Cahm's Sedger Paint More
States Aller Selser Electric Co.
Arnothe Josephson and Thomey
Milwaukee Nilgendorf Mowe.
Looks Mowe.
Paul 9 Howe.
Shorewood Electric & Howe.
Tower Howe. Co.

Onhhosh Stillmen Hdwe Co.
Recine Hdwe.
Sheboysan H C. Prenge
West Affin Pickert Ndwe.



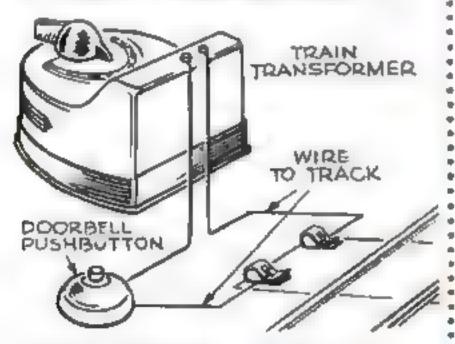
#### Fence for a Christmas Tree

A FENCE to enclose the base of your Christmas tree can be made from clothespins. Cut off one leg and nail or glue the clothespins 2" apart along a strip of corner molding nailed to the tree platform. Paint the body of the pins green, the round tops white.

—Norman Maire, Beaver, Pa.

PAPLASTIC mustard or catsup dispenser takes the mess out of inking my mimeograph machine. I fill it with ink and squeeze it over the stencil pad. A galvanized roofing nail effectively seals the mouth of the dispenser.—

Rev. Donald Nulton, Mehoopany, Pa.



#### Safety Stop for Toy Trains

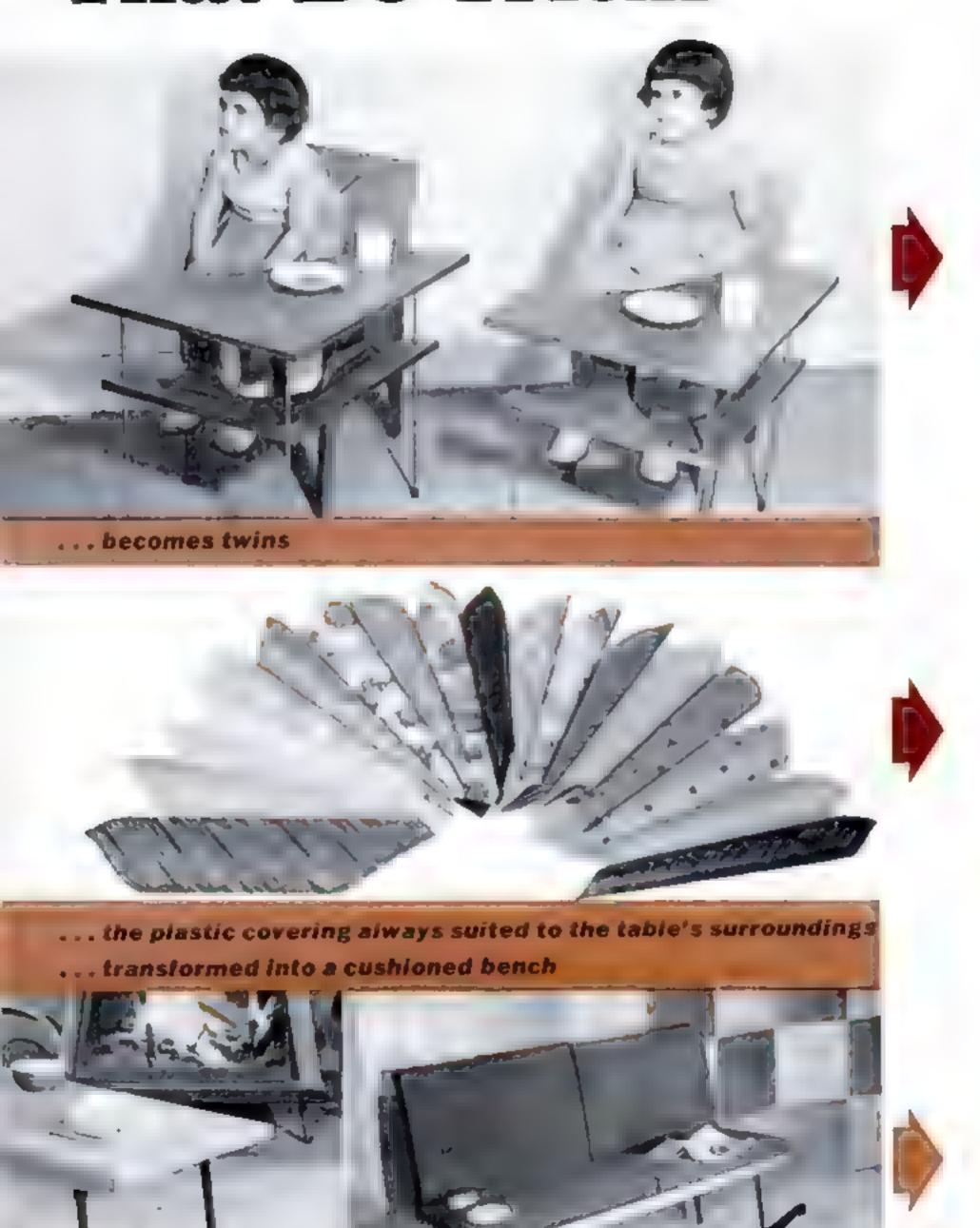
When my little fellow's electric trains derailed, he would often leave the transformer on while he placed the trains back on the track. The resulting short circuit overheated the transformer and could have burned it out. To prevent this, I installed my own "dead man's throttle": a doorbell button in one of the track wires. With this setup, the train will run only when the button is held down.—Daniel J. Scherer, Forest Hills, N.Y.

222 POPULAR SCIENCE DECEMBER 1959

# How to build 3 Tables



## That Do Tricks



Like to build use? Turn the page to find out how

223

#### Two-in-one table: mating S curves

THE apparently continuous grain and the gentle S curve of the tops make these two tables look like one when they're latched together. The effect comes from saber-sawing both tops from a single 20"-by-34" piece of 3/4" walnut-veneer plywood. The plywood laminations were hidden by wood tape.

The original was assembled with nails hidden beneath putty-stick filler But dowels or plugged screws also could be used. The legs are held by T nuts in 4" plywood disks, screwed and glued to the underside of the table tops.

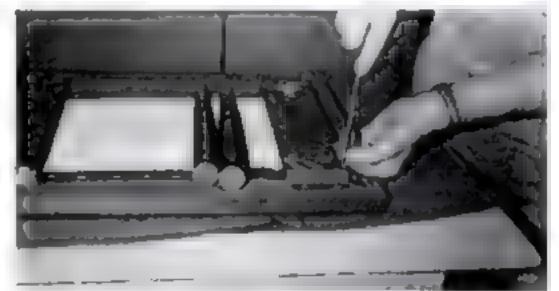


wood flanges hold I nuts into which legs—threaded %" brass rod—are screwed. Underside of top must be recessed for top of nuts.

#### Chameleon table: a frame on legs

THE table that changes color is nothing more than a frame on legs, holding a plywood top. The top is covered with printed vinyl upholstery material. It can be detached for easy replacement by removing the table's leg cleats.

Less than a dollar's worth of one of the new vinyl prints will give this table a top to match new upholstery or room decoration. The top is rugged, too. It is etain- and mar-resistant, and can be cleaned quickly with a damp cloth. If you want to change the color of the legs and frame, a single can of pressurized pushbutton paint will do the trick.

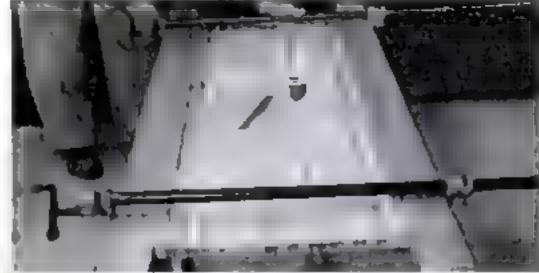


cross clears screwed to FRAME lock in the top. Clears fit within corner mending braces to give support to commercial tapered legs.

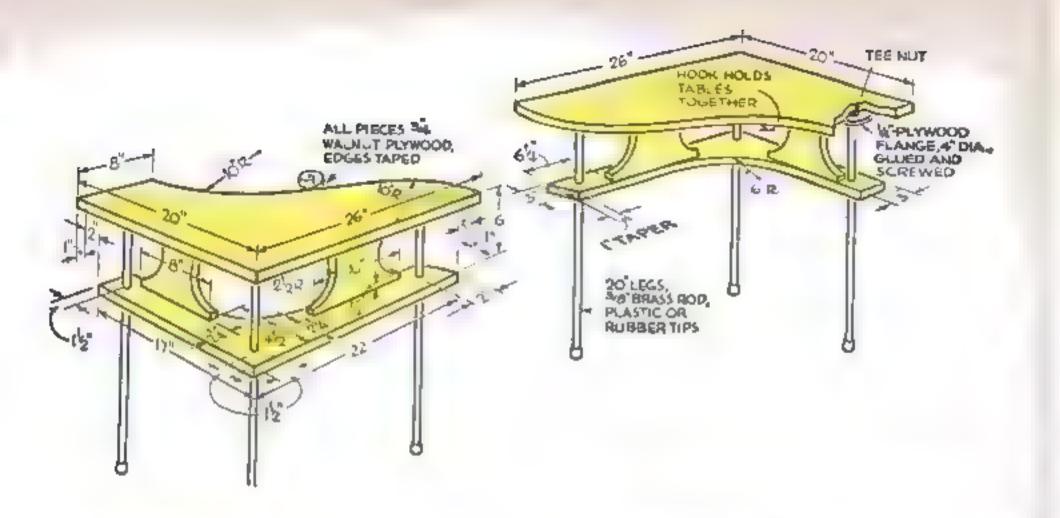
#### Disappearing table: glued strips

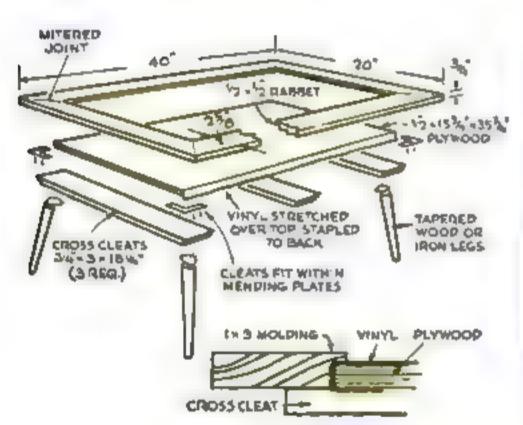
THE gimmick in this trick table is polyurethane foam—four slabs of it, each 2"-by-18"-by-27". Either upholstered or left bare, these foam cushions turn the table into a comfortable bench.

The table was made by laminating alternate strips of ash and mahogany finished to 18" by 13". Standard 3/4" stock could also be used by increasing the number of strips. The top was built up by gluing the pieces face to face with quick-setting white glue. Aluminum tubing painted flat black provided the legs. Steel pipe and flanges would do as well,



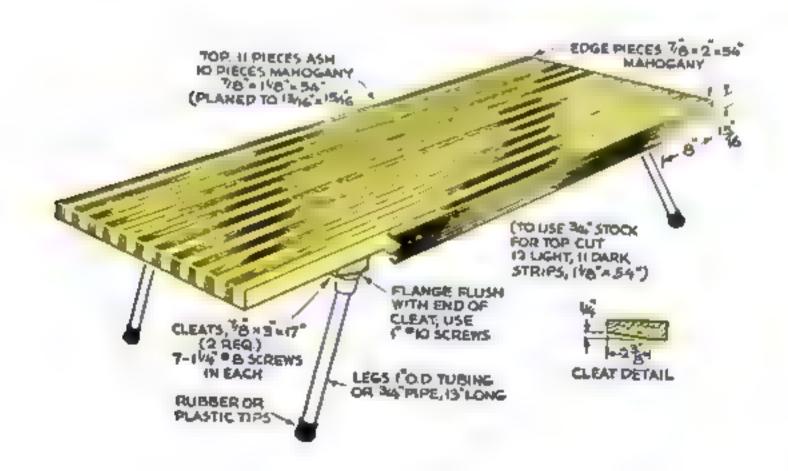
**DURING LAMINATION** with quick-setting glue, the table top is clamped between two-by-fours. The top must be sanded after the glue dries.







TOP IS COVERED WITH VINYL upholstery stretched into place, then stapled. Leather-gramed plastic is impervious to stains and scuffs.





Whatever your job or hobby, you'll find tools in the big Starrett catalog that will help you work faster, easier and more accurately. Write today for your free copy.

Use the coupon.

THE L. S. STARRETT COMPANY Sept. PS, Athol, Massachusetts	
Please send my free copy of Catalog 27 describing over 3,000 Starrett Tools for professional and amateur craftsmen.	
Rame	
Octupation.,	
Address,	
Сну	Zone State

#### Belt Drive Shifts Dutch Economy Car [(.antiqued from page 142]

the step-down reduction (the belts, at high road speed, are in what amounts to overdrive).

It's a cinch to dripe. Push the short selector lever forward and step on the gas. You take off as smoothly as a streamliner. Although acceleration is modest, you're doing 20 in a few seconds. Now, with the engine hustling right along, ease up on the gas. As manifold vacuum shoots up, the belt drive shifts ratio to maintain speed with fewer engine revs.

Hit a hill and you need only tromp on the gas. The belts shift down to the best ratio for the job. On the straightaway you can hit an advertised 57 m p.h and get, say the makers, an honest 40 miles to the gallon

Steering is fast but firm, braking sure, and the ride surprisingly good even on cobbles, thanks to really hefty shock absorbers and the four-wheel suspension. A lot of women drivers should be pleased. Those who have been tempted by other small imports but balked at sight of a gearshift will find they can't stall a DAF in traffic or anywhere else. The car can turn in a 28-foot circle—eight feet less than the VW.

What about downgrades? The centrifugal clutch disengages only just before you come to a stop, so that engine braking is available all the way. On really steep grades, you can yank out a button that reverses the vacuum action, holding the belt drive in "low" or maximum stepdown ratio.

The hard-pulling V belts are an industrial type. In tests, they have run the equivalent of 50,000 miles without failure. They won't even stretch, says DAF, for many thousands of miles.

But should they ever slacken to the slipping point, the turn indicator will stay lit. The DAF owner then takes his lug wrench, slips it onto a shaft under the rear bumper, and simply turns it until the light winks out.

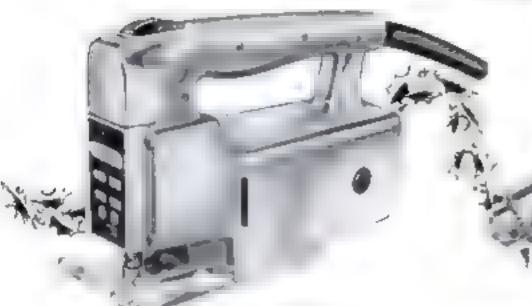
The drive is not enclosed. Tests in the flooded and snowed-in Dutch country-side showed that the belta will pull after standing axle-deep in snow or water. Stones, dirt, or mud thrown into the drive are immediately thrown off by the moving parts, say DAF's makers.

276 POPULAR SCIENCE DECEMBER 1959



# STANLEY

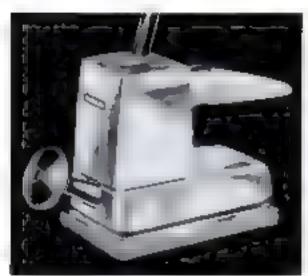
# Christmas Checials



Henry-duty nabre saw-special \$44.50 and you get 7 blodes worth \$4.90—FREE! Lowest-priced heavy-duty sabre saw you can buy. Cuts scrolls, curves, wood, metal. Special blades cut flush up to a wall and to %" along a wall.

MODEL HIT

\$6.00 off on 3-amp 1/4" drill—Reg. \$24.95 Stanley Christman special price—\$18.95 Most powerful 1/4" drill for the price on the market. Plus rugged bearing construction, non-slip pistol grip, 3-jawed geared chuck, 3-wire cord.



MODEL HIS

Heavy-duty erbital sender—\$49.95
Get two permanent obrasives—FREE!
You save \$4.00 and lots of work,
too. Powerful, rugged, the H36
gives satin-smooth finishes, fast!

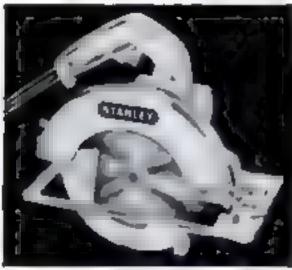


MODEL HIS

Save \$4.30 on new power drill kit.

A \$43.25 value, new only \$38.95

Complete with 3-amp ¼" drill, steel case, 19 extras including Swirlaway sander/polisher.



MODEL HIMK

\$15.00 Off on complete builders saw kit. \$67.95 volue ... now \$52.95 Powerful 6½" saw has rear controls, Free-start guard, ballbearings. You get case, etc. free!

Prices slightly higher in Canada . - Canadian office: Hamilton, Onf.

Electric wols built for the professional, priced for everyone

# STANLEY

Stanley Electric Tools, Div. of The Stanley Warks, New Britain, Conn.

### **ENGINES LIKE YOURS** LAST 200,000 MILES IN CABS AND TRUCKS



#### Fleet operators know the secret-replace key parts regularly . . . get like-new power!

Fleet cars and trucks are driven hard—around the clock, on short hauls and cross-country trips. At 50,000 miles or so, their stock engines are tired, yes-but not ready for the scrap heap! An overhaul by a skilled mechanic . . . new key parts like bearings and rings—they're off and running smooth and sweet for thousands more miles.

#### **WORN BEARINGS...SICK CAR**

Worn engine bearings have up to 25 times normal oil clearance! Excess oil slips past piston rings, burns to heavy carbon and sludgy varnish. These choke ring grooves and oil holes, foul plugs and valves. Result: your engine burns oil, misfires, pings and knocks. You get poor gas mileage; lose pep and power. Cure: a complete overhaul, including new Federal-Mogul bearings.

#### "OVERHAUL" INCLUDES BEARINGS

Every good mechanic knows that an overhaul without new bearings is a waste of time and money. So it's wise to do the job right at first! You'll get back many times the small extra cost.

#### ASK FOR FEDERAL-MOGUL BEARINGS

Main, connecting rod and camshaft bearings are



the heart of your engine. Yet it costs no more to use the *best*—Federal-Mogul Engine Bearings. Ask your mechanic!

## FEDERAL-MOGUL SERVICE



[Continued from page 116]

has occurred many times among animal species in the past, including the primates, Then the giant species became extinct. We don't know why."

An American Medical Association consultant pointed out that while there is a consistent increase in stature from one generation to the next where nutrition is improved, this does not mean that one can increase stature indefinitely through improved diet. It means only that the effect of poor nutrition can be negated by good diets. In short, there are limits,

#### Can medicine do anything to stunt or boost growth?

In limited cases, yes. To inhibit growth the female hormone, estrogen, has been used effectively in several cases of teenage girls who were growing too tall.

To encourage growth, injections of pituitary-gland extract or thyroid hormones have helped in cases where there has been a malfunctioning of either gland.

#### Can you predict how tall a child will be?

Fairly closely—usually, to within an inch or two. Based on records of thousands of persons measured from birth to adult age, the average boy can be expected to be twice as tall at age 18 as he was at age two. The average girl will double her 18-month height at 18 years.

It also appears that the average boy at 61/2—and the average girl at five—attains two-thirds of adult height. Also, on the average, a nine-year-old boy and a 71/2-year-old girl are three-fourths as tall as they'll be when adult.

#### How important is heredity in human growth?

Very important. Shorter-than-average parents are likely to have shorter-thanaverage children. And taller-than-average parents can expect to have taller-thanaverage children.

However, since genes from other ancestors as well as parents play a role in growth, even tall parents may have some relatively short children and short parents some relatively tall ones.



# THIS "ONE-TOOL" WORKSHOP FOR DAD MEANS A FAMILY MERRY CHRISTMAS

Home improvement projects come easy . . . are finished faster with this all-purpose, power cutting tool. A Disston "Dagger" handles every cutting job needed to finish a game room or an attic. With a "Dagger" you can build kitchen cabinets, bookshelf-dividers, fix the stairs or do any one of a hundred fix-up jobs. It's fast, easy and convenient.

Disston's "Dagger" cuts wood (45° through a 2 x 4), plywood pipe, plastic, formica and sheet metal. It'll cut through heavy house wiring and conduit . . . even frozen meats, bone and all.

"Dagger" is a rip saw, crosscut saw, hack saw, coping saw, hole saw, back saw and more... all rolled into one, with power edded. You carry the lightweight Disston "Dagger" anywhere, to do any job, conveniently. And even an "all thumbs" beginner is right at home with the "Dagger" See a Disston "Dagger" at your hardware dealers', now, while stocks are still on hand. Disston Division, H. K. Perter Company, Inn., Philadelphia 35, Po.

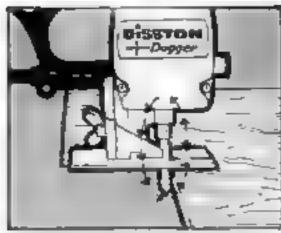




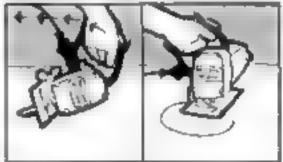
DIVISION

#### H. K. PORTER COMPANY, INC.

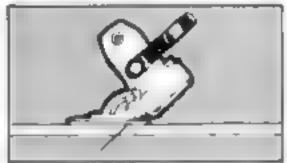
FORTER SERVES INDUSTRY: with Rubber and Friction Products—THERMOID DIVISION Electrica Equipment DELTA-STAR ELECTRIC DIVISION NATIONAL EXECTRIC DIVISION PEERLESS ELECTRIC DIVISION, Specially Alloys—RIVERSIDE ALLOY METAL DIVISION Retractories—REFRACTORIES DIVISION, Electric Furnace Steel COMNORS STEEL DIVISION, VU\_CAN KIDD STEEL DIVISION Fabricated Products—DISSTON DIVISION, FORGE AND FITTINGS DIVISION, LESCHEN WIRE ROPE DIVISION, MOULDINGS DIVISION, H. K. PORTER COMPANY de MEXICO, S. A. and in Canada, Refractories, "Disston" Tools. "Federal" Wires and Cables, "Nepcoduct" Systems—H. & PORTER COMPANY (CANADA) LTD.



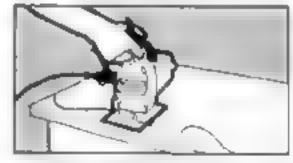
"Orbite" ACTION Exclusive Disston Orbite blade action cuts up, then backs away going down. Eliminates spiritering of wood and plywood. 3600 strokes per minute mean amouth, fine cutting action. Blade replacement costs pernies not dollars.



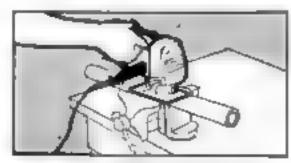
PLUNGE CUTS Makes inside cuts without dry ling starter holes. Works fast and easy for plumbing and electrical outlets and cutouts.



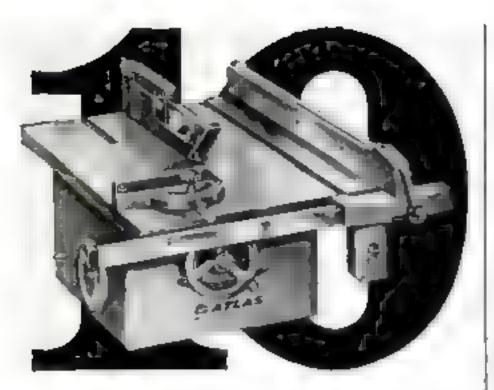
**CUTS 2.14's Plenty of power and blade** length to cut through 2" lumber, even at a 45" angle. Adjustable shoe readily set at any angle from 0" to 45" for beval cuts.



MAKES INTRICATE CUTS Cuts scrolls, curves, angles and figures. Takes the place of coping saw or jigsew on most jobs.



CUTS WARRIETY OF MATERIALS Cuts metal tubing, sheet metal, pipe, wood and plustics with ease. 9 basic blades for wide range of materials.



\*10 NEW FEATURES . . .

\*10 reasons why the NEW

## Atlas.

10" TILT/ARBOR BENCH SAW

is the greatest value ever!

- 1 NEW Cast-iron cradle, saw arm, trunnions...it's the heaviest, most rigid mechanism of any 10' beach saw, for superior workmanship. Saw alone weight 165 pounds!
- 2 NEW Big table capacity 20° x 2714°, 5914° x 2714° with two grill-type extensions.
- NEW Solid, ground steel arbor, % diameter at the bearings — big lubricated-for-life ball bearings.
- 4 NEW Double-locking lift-off fence—cast aluminum for lasting accuracy.
- NEW Big, efficient mitre gauge keyed to table for greater cutoff capacity.
- NEW Free-turning 6' diameter cast-iron handwheels.
- 7 NEW Removable motor mount for easy portability.
- NEW Dual V-belt drive for transmission of full power, spring mechanism for proper belt tension.
- NEW Motors . . . continuous duty, totally enclosed, designed specifically for saws.
- 10 NEW Economy...you have never seen such "plus value" features, such rugged quality in a saw so modestly priced!

ONLY \$129.75

Slightly Righer West of Rockies.

\*10 REASONS WHY YOU SHOULD WRITE FOR COMPLETE
ILLUSTRATED LITERATURE, TODAY!



#### How Edison Built a Better Battery [Continued from page 135]

The dark days. However, bad reports soon began to come in, and then the reports grew steadily worse. After all the fulsome propaganda, it was a shock to learn that the battery containers leaked on being used; that the cells were of uneven performance, and usually dropped about 30 percent in power. Defective batteries returned to the factory were examined. The electrical contacts in the positive (nickel) element were found to be unreliable, although Edison had thought he had corrected this weakness by introducing graphite in the positive pockets.

What was to be done? All the exuberant advance publicity, the habitual Edisonian optimism, had but made things worse. Moreover, Edison had raised \$500,000 by giving a bond and mortgage on his other manufacturing properties; and these funds had all been exhausted.

He made his decision swiftly. He would shut down production at once and take back all the batteries that had proved defective, at his own cost.

Virtually his whole laboratory force set to work to overcome the irregularities. The new series of experiments were to engage Edison and his staff for five years more.

One chemist and his assistant were put to the task of improving the leaky containers and working out a superior welding job. Another group worked over the iron element. Still another, with Edison participating directly, was occupied in building up the conductivity of the nickel hydrate. By the summer of 1905 Edison had again made a "vast number of experiments, now reading 10,296," and "had found out a great many things."

When an associate assured him that certain experiments gave progressively worse results, and that they simply posed "a problem without solution," he replied with spirit, "I've been in the inventor business for 33 years, and my experience is that for every problem the Lord has made He has also made a solution. If you and I can't find the solution, then let's honestly admit that you and I are damn fools, and not blame it on the Lord and say He created something 'impossible.'"

The Fords go by. Meanwhile, the newspapers reported that a Rolls-Royce car with a six-cylinder gasoline engine had



YOU CAN TRUE SMALL MITER JOINTS easily by gluing two strips of CARBORUNDUM'S Garnet Paper to the top of your workbench... one Medium, one Extra Fine. Simply rub the joint back and forth, applying pressure on point or heel as needed.

A SAFETY RAZOR makes a handy little "sander" for smoothing small parts. Simply wrap a small piece of abrasive paper or cloth around the end of the razor, folding the ends inside—where the blade would normally go. When handle is tightened, the comb guard locks the paper tightly into place. Use CARBORUNDUM's Emery Cloth for small metal parts—Garnet Paper for wood.

metal edges. Just clamp the metal to your bench, or in your vise. Then tear a 1" wide strip from a sheet of Fine or Medium Emery Cloth by CARBORUNDUM, grip one end in each hand and sand away in "shoe-shine" fashion



MAKE A SET OF SANDING BOARDS for quick, easy finishing on small jobs. Cut five 9" x 12" pieces of plywood. Drill a 14," round hole about 14," from the end of each board—centered on the 9" width. Glue a sheet of CARBORLNDUM'S Emery Cloth on one side of each board—a different grit size on each, of course. Use a "peel-it-off" cement to make replacement easy Do the same on the other side of each board, but use sheets of CARBORUNDUM'S Garnet Paper for wood sanding. Hang 'em on nails near your work-bench—you il use them often,

STORE YOUR SANDING DISCS in an old metal pie tin. Cut the tin in half, then tack the rim to a wall, or back of your workbench. You'll have a perfect pocket for discs



KEEP WORKPIECE FROM SLIPPING in the vise when you're filing or drilling hores Just wrap a piece of Garnet Paper by CARBORUNDUM around the workpiece (grain side out), put it in the vise and tighten it up.

NEXT TIME YOU CUT A PIECE OF GLASS, whether for a window, a picture or the top of your desk—remember this! You can remove the sharp edges, square the corners, or make round edges with a Combination Sharpening Stone by CARBORUNDUM. Just rub the stone against the glass to get the shape or contour you want.

auto distributor contacts and other hard-to-reach electrical contacts can be cleaned with a ½ dowel with a small disc of Fine Emery Cloth by CARBORUNDUM glued to the end. Just twirl the dowel between the palms of your bands.

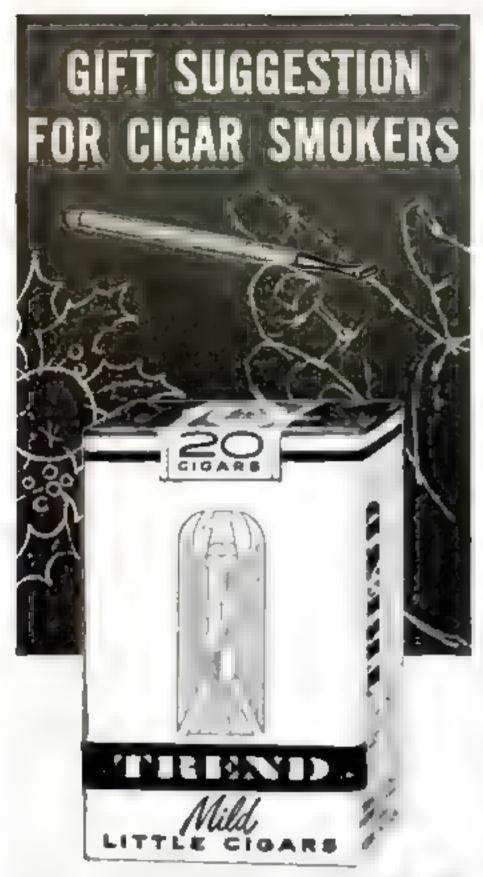
GLUE A STRIP of medium grit Emery Cloth by CARBORUNDUM to the straight-edge of your circular saw miter gauge . . . keeps wood from slipping while you re cutting.

because the shank is worn and it slips around in the chuck of your power tool. Wrap a short strip of Emery Cloth by CARBORUNDUM around the shank, grain side in—insest in the chuck and tighten. Works fine!



see your local hardware dealer and always ask for abrasives by

CARBORUNDUM



Give a carton of TREND—200 wonderfully mild, satisfying little cigars. He'll like the modern TREND size . . . short enough for busy people to enjoy anytime. A superior blend of Havana cigar tobaccos with big cigar taste and aroma. Free Trend cigar holder with each carton.

Humidor Pack of 20−35¢ Carton of 200-\$3.25

(Plus applicable state and local tax)



#### **GET THIS GIFT CARTON**

at leading tobacco counters everywhere Stephano Brothers, Cigar Division Philadelphia 7, Pa.

PIONEER IN MODERN LITTLE CIGARS

#### How Edison Built a Better Battery

passed a 10,000-mile endurance test. In Detroit, Henry Ford, working with a will as fierce as Edison's, perfected a cheap 15-horsepower four-cylinder engine for his Model N car, precursor of the celebrated Model T. The Model N went 20 miles on a gallon of fuel and cost only \$600. "Hundreds of persons," it was reported, rushed to buy Ford's small car. Had Edison missed the bus?

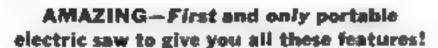
In the years 1905 to 1908, Edison applied for a long series of patents covering refinements in his storage battery. especially the process of making metallic film or flake out of nickel by electroplating. He and his associates had managed to obtain nickel film or flake as light as thistledown—about 4/100,000 inch in thickness. This was accomplished by electroplating thin layers of copper and nuckel on a metal cylinder, then dissolving away the copper, leaving nickel film so fine that tiny segments of it, about 630 layers, could be packed alternately with nickel hydrate in a cell pocket that was only four inches in height. The nickelflake process gave Edison an improved electrical contact, and lightness, while extending capacity and wattage.

"At last the battery is finished," Edison wrote in the summer of 1909, with evident relief, to the head of the Adams Express Company, who had been waiting to use his improved product for delivery wagons.

Better late than never. A year later factory production was resumed on a large scale; in the first 12 months a million dollars' worth of the new "A" battery cells was sold, beginning a profitable career for the Edison Storage Battery Company.

Several important carriage works. among them Anderson's of Detroit, hastened to produce electric runabouts and light trucks, known as the Detroit electric, that were powered by an array of Edison cells. The similarly equipped Baker Runabout also had some vogue between 1911 and 1914. Department stores used such electric trucks for years, Light electric town cars were popular because they were noiseless and fumeless; their radius was about 60 miles a day between chargings, and their Edison batteries unlike lead batteries that needed long periods for recharging—could be fully recharged in seven hours.

# 1/2HP WIED SOUPED-UP SABRE SAW



- cuts a 6" board or 5" log yet cuts any pattern, too!
- cuts all metals up to ½" stee!
   and 2" pipe!
- cuts 4x4 at 45°... fine pattern work in most any material, including sheet metal and sheet steel!
- does everything a pattern saw will do . . . out-performs a circular saw . works as band saw or nibbler, too!
- beautifully balanced, lightweight, smooth-running . . . completely safel
  - makes cuts only a chain saw could—until now!



MODEL

vinc

\$44<u>95</u>

Look wing who det dappo de.

Look wing who day 1 the base bar and 7 bade on the part and bade 10 see parts.



SPECIFICATIONS:

We int B bs Power HP more de vers 3400 sirokes

per minute tensit of scione 1. 3 wire 8 is cord with a solo

ings at stee under neustral

Heavy du y n ar and o-

11DV & amp AC DC

WEN PRODUCTS, INC 5816 Northwest Highway, Chicago 31



#### Medel 516 Pewer Saw Kit

B saws in 11 Cuts 2 x 4's, % steel, snything! Works as rip saw, ile saw, aross aut, scroll, coping, back, band and keyhole saw, Cuts any shape, makes awn starting hele. Saw Kit with saw, rip guide, circle cutter, & blades,



#### 

Straight-line action for perfect, acretch-free surfaces. Sand wood, metal, planter patches, etc. Poljoh our, furniture, any nurince. 3 types—fine Noishing, general utility, heavy duly. \$13.95 to \$19.95



#### 8-Speed 34" Power Britt Late you change from 1988 to 2008 rpm to get just the right speed for different jobs. Delivers meximum torque under tood, 36" Jacobs peared chuck, 36

Jacobs poored chuck, 36 piece Accessory and Tolor Kit, \$0.05, Drill only, \$30.55,



#### Electronic Soldering Guns

for practically all home soldering jobs. Working hot in 2½ to 6 seconds. Long reach, long life tips, sutomatic spotlight. 6 models 100 to 250 wattracts. \$5.95 to \$15.95



#### How Edison Built a Better Battery

But not good enough. The nickel-ironalkaline battery was generally acknowledged to possess special merits over the heavier lead-acid affairs, because it resisted decomposition, was well nigh completely reversible, and showed a long life. Edison had hoped, above all, that it would be adaptable for automotive traction. Automobile traction proved to be just what it was not suited for. Nor was it useful as a starter battery. Its voltage capacity tended to be lower than that of contemporary lead batteries, so that one needed more Edison cells for a given task —which offset their advantage of lighter weight.

The Edison battery was also affected by cold temperatures, its alkaline electrolyte becoming weak and slushy. When winter came, it was common for Edison-powered vehicles to become stuck in snowdrifts. Meanwhile the far-ranging gas buggies of Ford and others, with their cheap, improved combustion engines,

swept all before them

Other uses abound. On the other hand. the beautifully constructed Edison battery was found particularly useful where dependability and long life were important, as for standby purposes at power plants, and for railway signaling; or to provide current for miners' lamps, train lights, and other railway and marine apphances. A remarkably wide field of usage was developed in industries such as mining and quarrying (for firing blasts), on merchant vessels, and on ships of war. Edison batteries were also used at first to manipulate naval torpedoes; later a model was developed for driving submarines.

Was it worth the tremendous expenditure of effort? Edison used to profess that his inventive work was guided only by commercial success. But the profits were on the moderate side, in the end, when measured against the "punishment" he had taken in heartbreaking experiments lasting nearly 10 years.

Why did he go on and on? "I always invent to obtain money to go on inventing," he said simply. A few more of Nature's secrets had been wrested from her.

As one of his laboratory confreres remarked, "Secrets have to be long-winded and roost high to get away when the Old Man goes hunting for them."

### of Stanley Tools I want for Christmas

Dear

(Write your Stanley Claus' name here)

I'd like a Stanley Tool from this list if you want to give me something I really need and will use. I've numbered my choices in order of preference. It won't

just be a surprise. It will be a Christmas gift I'll use and appreciate all year long and many years to come.



#### Special Note to the Men of the House

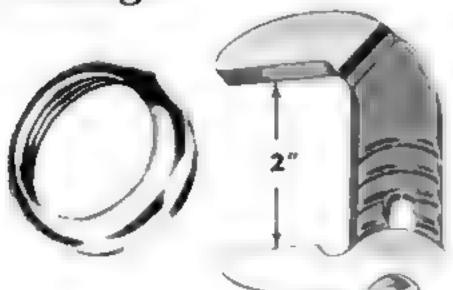
of too many ties for Christmas, Cut out this part of the page and leave it where it will do the most good. You know Stanley Tools.

Here's your chance Reduce the possibilities. You know what you want. Many times the ladies and youngsters don't. Help them out. They won't mind and you'll be glad you did,

Stanley Tools—The Tool Box of the World A Division of The Stanley Works, New Britain, Conn.



#### Can't Gouge Chrome Fittings...



The Jaws

are SMOOTH

# CHAN NEL LOCK

#### No. 415 Smoothjaw Plier

Now you can change faucet washers-easily, quickly-without gouging your chrome fittings . . . thanks to the CHANNEL-LOCK Smoothjaw Plier, The "toothless" jaws are adjustable for any size fitting to a full 2". The machined, undercut channels are smooth working . . . can't sho under any load. Equip yourself with this handy pher. You'll be glad you did next time you have a dripping faucet. If your tool supplier is out of them, ask him to order a genuine CHANNELLOCK Smooth;aw Plier for you.

Write for Catalog of Complete Line of Pliers

CHAMPION DESEMBNY TOOL COMPANY

Meadville 2, Pennsylvanie

#### Auto Tunnel to Pierce the Alps

[Continued from page 12+]

above the road The tunnel, though, will be 30 feet high. Beneath the roadway there will be 10 feet of space that, besides the fresh-air ducts, will contain telephone and telegraph lines, and perhaps eventually also electric power-transmission lines and oil pipelines.

Gateway to all Italy. You'll emerge from the tunnel at Entreves, in Italy. The two entrance towns—Chamonix and Entreves—will be turned into close neighbors to each other by the tube. Today they're 97.5 miles apart by those hairpin and hair-raising roads. Soon only eight beeline miles will separate them.

The cost of the tunnel, around \$30 million, is being split almost equally between the governments of France and Italy, with a small contribution from the canton (county) of Geneva, Switzerland, The two construction companies, French and Italian, will administer the tunnel for 70 years. Then it will be taken over by the French and Italian governments.

A French engineer, Arnold Monod, was the first to advocate a traffic tube under Mont Blanc—over 30 years ago. He pointed to Alpine railroad tunnels as examples—some of them longer than the Mont Blanc auto route: the Mont Cenis, eight miles in length; the Simplon, 12 miles; the St. Gothard, over nine. (The only certain way today to get your car over the Alps in winter is to have railroads haul it via these tubes.) By 1935, a syndicate was formed to build the Mont Blanc tunnel. But wars and rumors of wars kept the project (and European motorists) stalled till now

New and improved methods. One big advantage has been gained by the delay. Tunnel-building methods have been vastly speeded up, principally by Americans, and American methods are being used on the Mont Blanc job.

Jumbos, for instance, which are at work beneath Mont Blanc, are the biggest American contribution to rapid tunneling. In 1932, faced at Hoover dam with the need to construct quickly a river-carrying tunnel, a man named Woody Williams first designed this gimmick. A Jumbo is a big steel scaffolding on wheels that run on tires or rails. It is custombuilt on the job by steel fabricators to the width and height of the tunnel.

Buy this Tape and get a present for HER at no extra cost!

SAVE 99 cl. BUY THE LUFKIN Banner

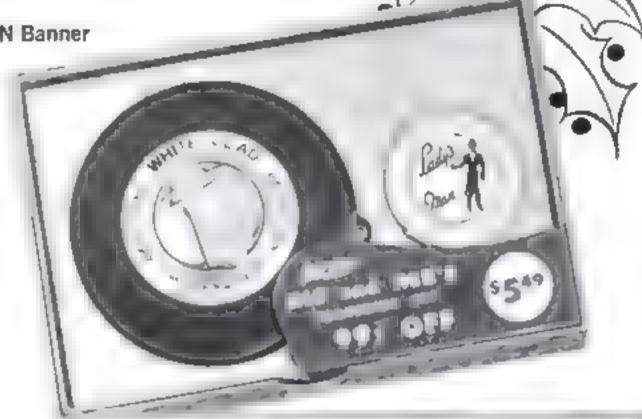
50' tape and get a 6' tape rule for your lady at no extra cost!

Buth are packed in a handsome. gift box, Buth cost only \$5.49.

And now the Banner has improved markings marking for setting studding and quickly marking off any combination of 16" spacings. Bold black against pure white makes reading easy.

And that companion steel tape rule will be a treasure to any woman. No bigger than a compact, so it bis in handbag or sewing kit. And there's a handy calorie counter on back of blade!

Pick up a set next time you're in a hardware store.







YOUR ENGINE AT ALL SPEEDS WITH ANTA-LITE RESISTOR SPARK PLNGS WITH

LOOK FOR THE PROTRUDING TIP!



I GOL MAPS. Standing shaft, \$7.95
Winn't rust or chief Lines 1/8 7.95
fill binder as larger. A RP
for the to 2000 chieft disk chill see highly
for the to 2000 chieft disk chill see highly
for the total that the total free
leasty Darky hall. Sensing \$1.2.95
Findings of pask with ander a contest free
BONEY BACK OURSELE.

CELLAR BRAINER 15 "high 1500 GPW 512.95 ( less

LABAWCO FUMPS, Belle Mood 3A, N. IDEAL CHRISTMAS GIFT FOR ANY MAN

SIMPLE, EASY-TO-USE --- ONLY ANYONE CAN WELD, BRAZE, SOLDER, CUT,

Sort campbolo with twin carbon sty latch, welder's phield, carbon, welding and brating roots, Roody to you.

HEAT MOST ANY METAL WITHOUT EXPERIENCE fiver 200,000 in use in homes garaces, farine, shope, factories everywhere. Bure money earn touney, making and repairture and rulings, farm equipment, mar-ture and rulings, farm equipment, mar-chinery news mawers, fore Bone 1001 jobs on Izun, steel branze, brass, alump-nam, sic Operates on any properly wired 110 AC or DC line.

SEND ONLYSS Pay postman \$11.75 plus (netructions included, Ideal lifetime affit for hobbyist, mechanic, but rodder, home-owner. Order direct on 10-day money back FUATABLES OF WELDER CO., Dept. F3-N 1810 S. Federal St. Chicago 16, IN.

#### DREMEL MOTO-TOOL THE "POCKET SIZE MACHINE SHOP"



MOTO-TOOL MODEL No. 2.519.95 steel cutters, grind ng 

MOTO TOOL KIT No. 2 (at shown) Incl. Model No. 2 Moto-Tool, 23 accessories (high speed wheels, etc.) in a stordy storage case......

QUALITY POWER TOOLS SINCE 1934

DREMEL MFG. CO. Proj. 129-M. EACINE, WIS.









# PEEL PAINT OFF











## KLEAN-STRIP

Fast • Clean • Non-inflammable

THE KLEAN-STRIP CO., INC.

2340 S. Lauderdale, Memphis 6, Tenn.

#### Auto Tunnel to Pierce the Aips

Jumbo—chariot automoteur to the French—holds platforms at different heights, with rock drills mounted on them. The high-speed drills bite fast and deep into the hard granite: 20 inches a minute to a depth of 14 feet. Holes are drilled in a preset pattern.

Then dynamite is packed into the holes, Jumbo and drillers roll back, and

the charges are set off.

More American ideas. Back come the molemen—this time with a mucker, another device Americans have been demonstrating. A mucker is a big machine with a shovel on its front that scoops up the fallen rock and debris. Then it tosses the muck backwards into gondola cars.

At this point, another U.S. mechanical tunnel builder gets to work: the cherry-picker. The cherry-picker, a kind of overhead crane, hoists empty gondola cars right over loaded ones that are being hauled out. Then it lays down the empty cars to receive their loads of muck.

Using muckers and cherry-pickers, and, above all, Woody Williams' Jumbo, U.S.-directed crews have been setting tunneling records around the globe. The present world record, startling to the fraternity of molemen, was recently made in Australia under the leadership of a group of U.S. companies (Kaiser-Walsh-Perini-Raymond). On a tunnel of comparable height and width to Mont Blanc's—part of a hydroelectric project—in one incredible work week, the lads dug 484 feet—four times the expected average.

Time, money, and pride. Speed is just as important in digging a highway tunnel. So long as it's under construction, it's eating money. Once it's done, the tolls start coming in. That—and pride—are reasons the French and Italian molemen are racing each other.

Building every major tunnel provides know-how for the next one. So Mont Blanc may show the way for half a dozen other auto tunnels through the Alps.

However that may be, the Mont Blanc tunnel will be a throughway for thousands of vehicles: a thousand or more a day, carrying up to a million persons, are expected in the first year of use.

Providing a way across the Alps that both Hannibal and Napoleon would have envied, it will remove one of the world's

biggest roadblocks.



# BUILD-IT-YOURSELF

Plif mark no causetty and performance Wood size and at mount remarked for the base for arise Simplified Para for the size paragraph of the form of the Mean Parts X 1 52 1 23 with 14 promit to bade \$27 40 Miney Plans

ha in gustal see Englose this Ad for PREE OFLIVERY Or too K L now or 55 % of 1 Parties Plans refundable with or tier A, so \$5 % dett. 2 Pas 7 ATHE K(), PREE CATALOS

SILLION POWER TOOLS MIS. CO.

PLANS OR Y .00 Bach Postpark

Ocol. PS-12, 1109 N. 2nd St., St. Charles, Missouri



In Stock - Immediate Delivery

Gears speed reducers approchets thrust bearings flex be couplings pullers etc. A complete line is carried in our Chicago stock Can also quote on special gears of any kind. Send us your blueprints and

Sand for Complete Catalog No. 220 CHICAGOGEAR WORKS 640-450 N. Oshley Bird. Chicago 32 40.

# **44** 00

Start year own husiness, sell tools to your friends and neighbors, or buy tools for your own use and SAVE MONEY \$\$\$.

BUY AT WHOLESALE PRICES, Estra \$25.00 profit on your personalisted quechases. \$1.00 refund on first purchase or refunded Li you are out 100 %

A MICCION DOCLAR INVENTORY AT THOUSANDS! I of Mariamany Adventiend street of Hostel Track, Power Tools, Machiner Tenls, Teel Chrys, Pant Sprayers, Eight Fistures, Appliances, Gurre, Gifts, Tays and other stone too WE SHIP COAST TO COAST

PUTS YOU IN

BUSINESS

Wholesale Discounts up to 50 , OFF

SILVO HARDWARE CO., Dept. 12 107 Walnut St., Phile. 6, Po.

# V-M RECORD CHANGERS



# STIRRING STEREO SOUND!

An incomparable combination! Functional beauty is perfectly matched with audio engineering perfection in V-M record changers. They've rewarded millions with pure musical pleasure since the advent of High-Fidelity. Model 1201 - V M 'Stere-O-Matic' 4-speed changer, Plays all stereo records. Plays all sizes, speeds of monophonic records and plays them better! Model 1202 with 4-pole motor and plug-in head for magnetic cartridges. Both available on style-pleasing bases (shown) as Models 1227 or 1229, V-M Corporation, Benton Harbor, Michigan.





# **GIFT CHOICE FOR EVERYONE**

# America's Hardest Working Tool For Home, Farm, Industry

Look for this Vise-Grip display in your favorite hardware store. On it you will find the world's most popular hand tool in 3 models -2 sizes. Each Vise Grip model packs a whole workshop of uses. Locks on to the work...tight! Press new"Easy Release" and jaws apring open. Use it as a pliers, locking wrench, wire cutter, etc. Manufectured exclusively by Petersen Mfg. Co., DeWitt, Nebraska.

Vise-Grip Does More John Easier Than Any Other Teel !



"THE PERFECT CHRISTMAS GIFT"



Professional type welder for home, shop, farm, industrial use. Build, straighten, bend, repair auto bodies, feeders, lawn mowers, wrought fron furniture, railings, fences, farm equipment. Anything metal. Seve money—earn money in spare time. Operates on properly wired 118 AC line. Simple instructions included, Complete with helmet, electrode holders, are forch, flux, solder year, cables. Act pawl Order from this ad on 16 day money-back trial. I year guarantes.

talls. Literature on larger

DYNAMIC WELDER CO. BOPL D-I-M, CHICAGO 10, ILL.

# The Forgotten Power Tool [Continued from page 152]

If you're a modelmaker, an index head offers a bonus. It takes the fuss and error out of drilling radial holes—spoke holes in hubs, cylinder holes in dummy airplane-engine blocks, capstan-bar holes, or you name them. Here, you combine the automatic positioning feature of the index head with a jig clamped in the toolrest holder. Pass a twist drill through a guide hole in the jig and you'll get accurate alignment and precise spacing.

Even finishing is fun. Without once removing a part from its original placement on a lathe, you can usually rough-shape it, bring it to final contour, and

sand and finish it.

If you've shaped a turning in the usual way—by forcing chisels and gouges against the wood just above centerline—the surface will need a bit of sanding. Number 1 is a good starting paper. Then you can progress, step by step with finer grades, to as slick a surfacing job as you wish.

On the other hand, you may want to join a select group of experts who frown on sanding. In that case you can learn to make cutting tools do extremely smooth turning. Instead of scraping off unwanted stock the conventional way, you use either a cutting or a shearing action.

For cutting, you lower the toolrest well below centerline and angle chisel blades sharply upward to remove material exactly the way a hand plane peels off a shaving. But be on guard! Run the lathe at a low speed and use a very light cut. If you don't, the blade will dig in suddenly, wrenching the tool from your hands with disastrous results.

To get a shearing action, place the toolrest high. Then, holding either a gouge or skew on edge, move it parallel to the work, slicing a layer of wood from the surface.

Unless a turning is to be painted, you're now ready for the final touch—French polishing, staining, oiling, or waxing. Again, you can do it best with the turning on the lathe. Watching the grain pattern come to lustrous life, you'll agree with an old-timer's definition of all lathe work. "It's the pleasure of whittling soft white pine," he says, "with technological improvements."

248 POPULAR SCIENCE DECEMBER 1959

# SA SA

# SAY Merry Christmas

with train boards, tree platforms, Santa Claus, his sleigh and reindeer, Christmas Greetings displays

# Make them yourself—with foolproof patterns

These Christman figures and displays are big and bright and colorful. Yet you make them yourself—easily, quickly and with professional results.

with professional results.
On your roof, porch or lawn-or in your living room-they show the world

your Christmas spirit.

Your lumber dealer will sell you the Easi-Bild' Patterns you want Each pattern includes the full list of materials and paint you will need You buy these from your lumber dealer too.

and paint you will need You buy these from your lumber dealer, too.

Each pattern is full-size You simply trace it onto a sheet of % Homasote—then cut it out with a key-hole saw Your pattern includes complete instructions for the painting It's as easy as that and the results are truly professional.

Put a sleigh in front of the Christman tree, to hold the gifts. Use the 5° g 2 panel for a sound-deadening trans board, for a free platform - your dealer will cut Hamasole to the slee you require

Homasole to the size you require.

From a single Santa Claus to a complete Nativity Scene (often a group project for school church or club), you have a project that is worthwhile and satisfactory.

Homesote is the oldest and strongest instructing-building board on the market, saws and naits easier than wood, takes any paint or stain lasts for years

Visit your local Homasote dealer today Or-use the coupon below to order any of the patterns, or to secure the name of your nearest Homasote dealer

\*T M Reg. East- | Hild Pattern Company





# HOMASOTE COMPANY

TRENTON 1 NEW JERSE



enclose .	****	. for which	send me	the following	patterns:
CCI. Butterdoor		- M-N			

- [] Reindeer—80c | Nativity Scene—\$5.08
- 🔲 Santa Class—30¢ 🔃 Madeona Outsleer Card—80¢
- ☐ Bleigh—50¢ ☐ Jolly Snowmen—50¢
- Send name of nearest Homesote Bealer
- IN CANADA: Homasote of Canada, Ltd. . 224 Merton Street . Toronto 12 Ontario

# Unequalted value! Low erical America's functional America's functional America's functional America's functional trans, and diff 10 to 1 reductions. 40% more drawbar pull than ordinary tractors 8-1/4 to 1005 A- 2 amms and the functionary tractors 8-1/4 to 1005 A- 2 amms and the functionary tractors 8-1/4 to 1005 A- 2 amms and the functional transfer and trans



# 119 JG PATTERNS

Wood and saw out. Clever, CRIGINAL designs, things you can make to SELL. Wall shelves, lawn signs, planters, book ends, others, post

DURGESS VIBROCHAFTERS, INC., day, DEPT. C-125, Grayslake, Illinois

Loosens Rusted Bolts

Petendal Parts of Super-penetrating rust sol-

vent that quickly loosens rust and corrosion.

AT ALL HARDWARE
AND AUTO STORES





your fevorite dealer.

Div. ENERGY MFG. CO., Monticelle, Iowa

# HANDEE

GRINDS • POLISHES • CUTS • SAWS • CLEANS ROUTS • ENGRAVES AND BURNISHES





HANDEE all-purpose eraftsman's hand power tool Only 14 of Does 1 001 MMS wood carving, lewelry making plastics work, model building, ceramics, including etc.

PRECISION - ENGINEERED
Perfect y balanced coor running RANDEE his your hand
for delicate or rough work
Allows 366° rotation 25 006
r p m 110 or 270 voic
(please specify) 25 to 60
cycles AC or DC Quarasimed

No 6010- HANDEE Grinder, \$3255 45 Incomment, metal base 110-yest Only

No 4008 - HARDEE Crimder, \$2395

Enclosed is n	Mfg. Co., 5 t C3 W. Menroe St., Chicago oney order for set No
Please send	Ne HANDEE Calalog
Name	
Address	



More al immum lighter weight better performance beautiful styling. Stal World's Lowest Priced Car. Drive it for 75c a week. Rider Agents Wanted, If no dealer bear you send 25c for 32 page partire book, full details, dealer price or send \$1 (refunded first order) for the and Service Manual plus Repair Manual and 15 5x7 photos of car and factory.

MIDGET MOTORS CORPORATION, Athens 2, Ohio



# How Long Will the Heating Plant Last? [Continued from page 190]

U. S. homes. Their key parts are the grates. Good grates mean good ash control, which is a prime need for long life. Bend down and check the grates for smooth back-and-forth movement. They should work freely. Jerky grates, hard to move, mean a rundown unit.

Then see if the grates are perfectly flat across. Tipoff to poor performance is a set of warped or sagging grates. Chances are that such grates will soon have to be replaced. Look for an automatic thermostatic control for opening and closing the ash-pit damper and the smoke-pipe check damper. If you do not find them, ask about them

When can a coal-burning heater be converted to gas or oil? Most heating men say it is risky to convert a coal unit more than 15 to 20 years old. You might as well figure on soon having to get a complete new heating plant, they say. A unit that old is usually wrapped in an overcoat of white asbestos plaster. Most newer jobs are enclosed in a neat steel jacket.

"Indirect" water heater. In three out of four houses with hot-water heat the same boiler that heats the house also heats the hot water. This water flows through a cylindrical coil of pipe inserted in the side of the boiler.

When you see a coil heater like that sticking out of the boiler, there are two big questions you should get answers to, says Bob Ferry, chief of the Institute of Boiler & Radiator Manufacturers: How long will it last? And will it give you all the hot water you need?

Even though the coils are made of copper, the unit is a bad risk if the water is very hard. The coil will gradually get clogged with scale and eventually choke up. Ask for a separate hot-water-tank heater.

The capacity of the indirect coil is the key to having enough hot water. Ferry says to check the gallon-per-minute rating capacity. It is usually marked on the exposed flange of the coil. Minimum rating for a one-bathroom house today is 2.75 g p.m. of water-heating capacity. If the house has two baths, it should be a 3.5-g.p.m. size. If you have more than two baths or if you have a big family and use hot water liberally, it will pay to have a four-g.p.m. coil.

### **GOLF AND FACTORY** CAR MATOR

4 Hom #573. America buy' Use for got care fac or-Powerful expens ve bal

truns on any 12 v strong barrens relaction monor for tune of the tune of tune of the tune of tune of the tune of tune of the tune of tune of the tune of tune of the tune of tune of the tune of tune

### MISCELLANEOUS SURPLUS

Door Jell Transformer
the two lights Bell
DPDT Tagged Switches
20 to a Good Reducers
Do Ammeter-Grind
Army Fold of Wise Res
Private to the Switchboom
Vickets Hydracite Fump to 1
1 tow At centrifugat Pump
Fish and World Shocker
House Inburst by Experiments Kit
4 to Amp We sing Gerenstee
Pressure Air Tark 6 21 1"
At Worm Geor Motor
Motor to I tour Reducer Door stell Transformer 6 57 9 91 97 50 46 50 9 95 3 49 6 71 18-95 3 45 8 69 At Worm Geor Motor M to I hour Reduce Send for Free Cotalog

### CONTRACTOR PUMP

o Hem #300, \_'g' s.as 10 500 gpb. New hal-bearing certrings reign tops contractor pum groups 45 ft head of pu upm 45 ft hend ( Gnyt COAL SON \$49.50 FOR



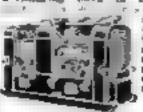
# AIR COMPRESSOR BARGAINS

Plus puinting electrical threat leading in Assemble own south the last threat the second for paint gun, relief tolve. Stings, hose (Supprings)

List 652 BALK \$43.91 POS 6 Air Components, Compression 1 or 1 or 1 to 35 Ar tent. 620.00 Neger stor 63 85. Page 51.00 Pagent Paint Con \$11 50 Auta Bujich \$4 78, All Prot n t N

## POWER PLANTS

· Amazing burn in Delince



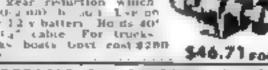
selection Weste for de-teriptive catalog Al. 1000-W \$169.75

GOVT, SUMPLUS EXCESS INVENTORY BANKRUPT STOCK

> 285 50 497 50 349 50 35000 W 7 5000 W 30840 W Get Free Gerglen. 169.50

## 4 or 12-V STORAGE BATTERY WINCH

194 a tem 2311 Powerful ful Rear reduction Lar on nontegran) h aut 1 se on d or 12 v battern. Ho ds 40° of 14" For trucks cabie dorks boats boyt cost #280



# PORTABLE AIR PRESSURE UNIT

ers of tanks on we game From a 4400 tons thre church sura) thrate have see the faptagent men and valve not shown) W( H /bs.

\$8.89 FOR SALE Pressure Tank only, \$4 95 Fills. No. - Cal.

### CONTRACTORS LEVEL-TRANSITS

# Heat # 604 Leating make brand new takes model leve amount with 6 pod and case 1 remark with to ped and rate land its endour install a primary and its error of transit Limited time \$69.95 ped.

• Maily office installment out a



### STANDARD DIAL PHONE

o Hom #715. Modern he office energy attraction of an primare to main line on private and the complete characteristics. charte statem cost \$43, BALE system \$9.95 ppd

# SPECIAL OF THE MONTH!

### SPEED REDUCER

ball and needle bearings heavy duty gear reducer. Ratio 86-to-1. Protective Clutch, etc. Input Shaft diam. Dual Output Shaft 1 diam



 Hundreds of farm and Industry uses. A Four Star Buyl Size 4"x0". Wt. 14 the. Govt Cost \$137 50 \$19.69 SALE

### HI-SPEED VACUUM-BLOWER UNIT

 How #1604, Industrial hi-spend 110-V AC motor driven vacuum blower unit Uneful suck ing dirt sawdust from power tools such as bench saws, shapers ate



 Solenoid permits selection of either of two tubes. Size 6"x18"x8" Wt. 10 lbs Original cost \$69.50. \$18.95 pan SALE

### 12-V DC ROBOT CONTROL MOTOR



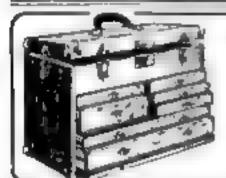
e Hem # 522. Powerful DC un't Geared reverslble motor operates lever lae to operate remote valves throtties levers. stearing doors, switches,

open-close drapes etc Govt

LINCOLN NERS

\$5.95 FOR





Eserted

and real tool protection Free calatog to topimakers and machiqueti

GERSTNER TOOL CHESTS

# Built to give life-long service

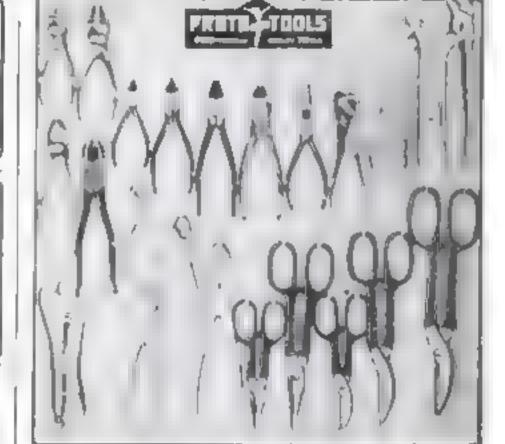
560 Columbia St. Dayton 7, Ohio

# Postpaid

# REVOLVING BENCH

A sensational NEW lifex Double forced passe handling but the days are, that wick rotate and his kild and a afe could exact the according area. I set us without tent sing work. It similar presable is the mode, maker or the panels note. I we see his has 2 of opening 3 of 5 per hand 3f mey back guarantee. Sent U.O.D. astemst deposit

RELAND HARDWARE, P. G. Box 117, BRISTOL, PA.



GENUINE ALNICO

AMAZING, PERMANENT, NON-ELECTRIC, HIGHLY PRACTICAL, Conduct in evening experiments. Hundreds of uses Retrieve valuable states such as gard, ask a fruit fresh or salt water tools from tanks a drocks Guananteed. Try any magnet one week. Money back if you are not well-pleased.

No. 8-710 (Wt. 53 at.) Has pull of 225 lbs. on steel block.....518.90 No. B-615 (Wt. 70 on ) Has pull of 125 lbs. on steel block. \$10.00 No. S 575 (Wt. 18 on ) Has pull of 75 lbs. on steel block. \$ 7.00 No. S-500 (Wt. 13 on.) Has pull of 50 dbs. on steel block. \$ 5.00 No. S- 90 (Wt. S on.) Has pull of 13 lbs. on steel block \$ 3.50 No. 8- 35 Hobbylst sesortment of 5 magnets. \_\_\$ 2.00 Send M.O. or check. We pay postupe, Survy as C.O.D.'s.

MIAM! MAGNET COMPANT, 3240 N.W. 27th Ave., Microsi 42, Fig.

Proto makes more than 80 different Pliers and Snips...and more than 2,100 other fine tools...each one guaranteed.

# PROTO TOOL COMPANY

2203 Santa Fe Ave., Los Angeles 54, California 503 Allen St., Jamestown, N. Y. 1703 Oxford East, London, Ontario, Canada



# If You're First on the Scene [Continued from page 69]

there. About one car in seven catches fire in a crash. But if fire does not start immediately it rarely starts afterward.

Fire in wiring usually begins smoldering under the hood or dashboard. Don't let this panic you into immediately moving the injured. There are three things to do: (1) disconnect the battery (being careful not to let the hot wire hit metal parts and cause sparks), (2) locate the fire, (3) attack it with fire extinguishers, dirt or blanket. (If you have no extinguisher, borrow one from a passing truck.)

Two drivers to notify police. Hail at least two passing cars and send them in opposite directions to find telephones and call police. Many motorists make the mistake of sending only one car, and sometimes no one at all is sent. Police say it is wise to send as many as four or five cars in each direction.

"If only one car is sent, its driver may go 10 miles, find no phone, and then give up," police say.

While waiting for an ambulance. If you are skilled at first aid you may find you can render some assistance. If not, do these things:

 Hail passing cars until you do find trained first-aiders, a doctor, or a nurse.
 In some states doctors can be spotted by "MD" plates, nurses by "RN" insignia.

Put blankets over the injured to keep them warm (but not too warm).

Loosen collars, ties, and belts to help the injured breathe easily.

 Do what you can to slow heavy bleeding—with cloth compresses or tourniquets.

 Send someone to find boards (or even to borrow a door from a house) on which trained first-aiders may carry victims flat if an ambulance fails to arrive.

Locate a truck on which victums can be carried flat if quick transportation is needed.

7. Talk to the injured; encourage them.

Never tell them anyone else has been killed or is badly hurt.

"We even hold their hands," a rescue man told me. "This is very important. A firm handgrip seems to give them courage. Tell them help is coming and that they'll be fine."



SOUTH WIND HEATER & ACCESSORIES

Mig for gove anterctic expeditions for jeens and
half-tracks Resting unit puts out ever 20 000
B TU a Surna any type gas. 6 vote system. Fuel
consumption retrimely low 1 gal per 3 bys. Terrife for trucks,
books, tractors, farms, werehouses, ranches, book houses, call na
ste Complete with eserges & installation manuals and over 260
components Approx GOVT COST \$550. Shpg. wt. 120 lbs. gross,
NEW \$30.08. Limited quantity

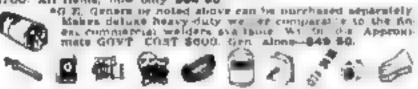
"SUPER 9" 200 AMP WELDING KIT With Defuse accessive consisting of one 200 AMP Gen. adjustable helmet, electrode holder 30' wording cubic records, guant toggic ewitch, voltmeter voltage reg. I be heavy-nucy welder to gover. All units guaranteed pre-lested Appens GOVT COST — \$500. Most flows new — all perfect. \$26.00.



"DELUXE 11" ARC WELDING KIT
Consists of 100-250 AMP Gen. vallage reg. ammeter, shoot, adjustable helmet, electrode holder pr. welder's gloves, 50' we ding cable, reactor coil giant toggte switch megalist. Append GOVT COST \$650 All units guaranteed pre basics. \$34.38 eomplete.



DC JET GENERATOR ARC WELDING KIT Complete with GE Type CM 77 Generator (30 vo to D C., 400 Amp. 3000 RPM appropriate reing in for continuous duty information, amperage in 500 to 500 across state 2 recorded 1 votage regulator. I vo timeter, 1 electrode holder, 2 ea 25 ft. lengths his 0 wold be cable. I wolder a mask 1 torgie switch, 10 th vacuum pethol the in. wolding rode, pair wilder's given a spline coupling Air up to guaranteed pre lessed. Wt 110 lbs Applica GOVT COST \$700. All tients, now unity \$64.50





DOUBLE-V SPLINE 3" PULLEY FOR P. ) B. I. GP. Less als we also us. Henry-ducy machine-broached above liesy by constructed with hand a my job, Not acres facked, shing Will I as NFW 25 25.

### BENDIX GEROTOR PUMP & MOTOR-NEW!

hydraulic installations. Has 44" pape connections, which is expected to the paper of the paper o cup. 6 GPM. 115 H.P., 24 V motor. Las. 36 V. Approx. GOVT COST \$350 \$8.78.



SENSITIVE ALTIMETER in 20 ft. Increments. O to 35,000 ft. 'Inches of Mercury: Famous Planeer, Tested & respected in our own instrument lab. Guaranteed per-fect. Appens. GOVT COST \$150 Wt 2 lbs. \$12.05

ELECTRIC PUMP WITH CONTROL UNIT
Buns on 12 or 24 V Centrifugal type. Draws 8.2 AMPS
Has built in removable filtering screen. Great for brige,
circulating or sump pump ball tanks, etc. Pumps \$100
GPH. Complete with on and off switch checkets, 2 speeds
the 6 to: Mrd. by Engersol: Rand. Shpg. Wt. 7 lbs. Approx.
GOVT COST 8195 NEW \$8.95.





RI GENERATOR - 300 AMP Make your own are we'ding and battery charging unit. Terrific accuracy of power for all 24-32 V equipment. Simple installation with our wiring diagram. All generators pre-tested in our swn abop. Appear, GOVT, COET 3400, Like NEW, \$16.50.



ELECTRIC STORAGE BATTERY WINCH

Powerts, reduction gear fady reversible but bearing salety tock of device Will hand a from a 1000 to more than 2000 the pull time on 6, 8, 12, 24, 32. Y hattery Ho do 50° of \$1.0° car v For tractors, boats, low trucks, etc. Complete with mounting bracket for mounting in any position, Appear GOYT COST \$400 NEW \$46.50.

## REVERSIBLE RATCHET WRENCH

with revers de rateire. 4 hexagon but sockets, 2 3 8" 2 9 10" 6 2 3 8" Mrs. by laws 1 Appress out T Cost 5213 per set. We bu dos. NEW Only 39 98 per sel.



SMIP'S BELL Standard about toward Stat Many bracket with removable clapter and be I happing. If gh. resorant take Decara we for best by home or parts. Brand new great gift 3, belle 4 lbs. 454.75, 65 belle-il lbs. 452.75. A - 519 98

NEW 1960 CATALOG! Tromondous takatog-our bigpret ever to y it at alex 10000 of pargains in war nur-plus & other items. Send 2he in coin far your they below or free copy with order. Where ppd. Indicated appl so to US only Other prices Fold Culver City, Cas. Send cash, check, to county apper 3000 dep. COD.



AIRBORNE SALES CO., MC. BEPT. PS 1258 \$501 Stellar Drive, Culver City, Calif

# NCREASE YOUR WORK POWER with

Table saw operators make speedy and accurate dades, rabbets, and tenens with your . . .

REGULAR SAW BLADE

Avoid time consuming dade head or webble washer adjustments. Hit Bir E. Fi front siew. mirror is held on the year edge of saw jable by two powerful magnets. Watch enw binde insite accurate contact with work piece. Push work piece against \$11 SEE 11. which retracts below table terel and after cut to completed uttrot spr bits back to eriginal actions Angle is actionable traid errors. Get the picture before cutting Y mr eyes won't decates you. Money back guarantee. Yo table saw complete without hit REE-Fi, blakes an pice, got

\$3.95 + 25¢ for postage and handling MI-SEE-PI DEPT. P S

P. O. Bax 481, Great Neck, N. Y.



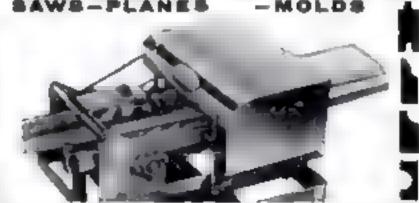
# GUNK-it-yourself!

Gunk® G.P. removes grease from engines or concrete floors, cleans paint brushes, power mowers, or machinery completely, economically, safely. It a ready-to-use, rinses off with water, won't clog drains. Quart size with heady "5quit Spout" top speeds application. Insist on the best degreaser - the original "GUNK" at better automotive supply and hardware retail-



K CHICAGO CD., Moor Farnat, RABIATOR SPECIALTY CO., Charlotto, No. Carollina serving the Sant, Santager and San Wast

### NEW BELSAW MULTI-DUT SAWS-PLANES -MOLDS



Now you can use this ONE power-feed shop to turn rough turnber into moldings, from flooring furniture. ALL popular patterns, MOLD separately or all at once with a one HP PLANE motor Use 3 to 5 HP for high speed output. Fully Sale goarded Low Cost. You can own this power tool for only \$30 00 down payment.

Write TODAY for Free Catalog BELSAW FOWER TOOLS, 920 Field Bidg., Kansas City 11, Mo.

FIRST AND OLDEST KIT BOAT

Most complete line of PRAMS, ROW BOATS, OUTBOARDS, CABIN CRUISERS and new Lapstroke kits.

MAIL 50c (coin) REFUNDABLE for BIG COLOR CATALOG Showing all models 8' to 23' including occassories, paints, etc.

**KITS** 

your own. U-MAK-IT PROBUCTS DELAND, FLA.--- DEPT. 11

All you need to build

# AConomize on Gasoline

Get more miles per dollar—install an AC ACan-O-Miser between your feel pump and confureror Reduces flooding and stalling . tailors feel pressure—precisely and instally—to every driving condition from idle to full throttle. The best amwer yet to real quastine economy?

**AVAILABLE** 

at Your Nearby Service Station, garage or General Mators Dealer



AC SPARK PLUG OF THE ELECTRORICS DIVISION OF GENERAL MOTORS







No 2500 BERSAMIN
Super 15 Shat BS
Gas Pistol Safe
No Pumping Uniform Hi-Farms
For Yargat & Small Garm \$17.95
No 2520 BERSAMIN 20 Shot Cal
22 Gas Pistol Economical \$19.95
No 1300 50-Shat BS Air Pistol \$27.50
No 1300 50-Shat BS Air Pistol \$27.50
No 1370 BERSAMIN 35-Shat Cat 22 Air Pistol \$24.50
No 1370 BERSAMIN 35-Shat Cat 22 Air Pistol \$24.50
Air Size \$15.55

GELLING All Montes Benjamin Single Shot & Goodstors—Cal. Bil. or 177 or 22. Asso, Special Hunting & Finding Ently Other DENJAMIN AIR RIFLE CO., 852 MARION ST., ST. LOGIS 4, MO.

246 POPULAR SCIENCE DECEMBER 1959

# Go-Karts: New Family Sport [Continued from page 82]

wheels and tires, clutches, dual carburetors, fuel injectors, tuned exhausts, engine mounts, matched sprocket sets, special pistons, hardened crankshafts, roller-bearing con rods—an infinite number of combinations are possible to suit your own notion of how to get the edge on the competition.

A break for beginners. As with other auto sports, the main interest of the serious hobbyist is the power plant. Getting more performance out of an engine than the manufacturer built into it is a challenge few can ignore. With these little two-strokers, the beginner gets a break. All the tricks his more experienced brethren have learned for souping up four-stroke engines are of little use. The novice, working on the kitchen table with a handful of tools and adequate instructions, stands a fair chance of success.

Engine manufacturers are eager to help with instruction and advice. Clinton Engines Corporation, for example, offers complete directions for hopping-up their engines and blending special fuels to get better performance.

New engines are in the works. Clinton is reported to have spent over a half-million dollars recently, developing new engines specifically for karting. West Bend Aluminum Company has announced an all new 5.8-cubic-inch engine for production beginning next month. This will squeeze in the last fraction-of-an-inch displacement for qualification at the very top of Class A. Two of them in a dual installation will qualify at the top of Class B.

As further evidence of their confidence in the future of karting, West Bend has recently built a new proving ground for karts, including a special asphalt-paved track. Besides using these facilities for their own engineering development program, West Bend is offering them to kart manufacturers to use in improving the karts.

These are just a few of the clues to what karting is doing to the one-lung-engine business. Other makers, McCulloch, Power Products, and Homelite have felt the impact of this new market, too. Some insiders predict that karting will provide the major market for the little engines before long.

This One OTWN-8G4-882L



# The Modern PLASTIC for lasting Home Repairs

PERMANENTLY mends cracks or holes in wood tile stone or planter Sticks and steys nut-Does not chip, shrink or fall out Easy to use Economical Modit chisel it, polish or paint it The big 4 ib. can is obtainable from your jumber paint or hardware dealer at \$1.40, or will be shipped direct postpaid (in U S) for \$1.75 Complete satisfaction gueranteed or your money retunded. Order

DONALD DURHAM CO.

Bex 804-U Des Moines, lawa

HROAC, Late the Late the control of the first term of the term of the control of

SEND ONLY \$3.00 canh ck mist and any past are done only the ser think the life to the life the diff will a mail broke toy condition a filter one

WESTERN SADIO Dept 7PS 12 READNEY

Also NEW 1988 had an More has a custom a range on third 1981 had needed in the British of the Politic States Politic Pol

ALBERT CONSTANTINE AND SON, INC. 1030 Englehenter füt flept T-0 New York Q) N Y



# RETAIL PRICE \$125 00 FACTORY TO YOU S**70**95

SUPERSHOP Includes procisionbuilt B" tilting table saw, vertical and horizontal drill press, 30" laths, sander, grinder. 100% BALL BEARING, Write for FREE catalog, full details, trial plan.

UNITED INDUSTRIES, INC.



Pewer Tools Division 226 VATES AVENUE

BELGIT. WISCONSIN

THE NEW MARCH OF DIMES



THE NATIONAL FOUNDATION



Tired of receiving the usual neckties and lotions for Unristmas? Cop this aid and put it where the right person Will see it'



# OUTSTANDING

WIZARD 17-PIECE SOCKET WRENCH SET

Professional quality hotbroached sockets in the most needed sizes!

1/4"-drive set includes 12 sockets, 19" Speeder, 10" Ratchet, 6" Extension, 15" Tee Flex, 9" Cross-bar and heavy steel tool box.



Wantern Auto destars dust their poor playing and set their man terms. Frame may surp nightly in some parts of the U.S.

remendous Savings on

Equipment for farm, home, work-shop, factory Hydraulic equipment, pumps motors, construction and diesel equipment and parts atc. Write for @

Hundreds of FREE Catalog today? Surplus and Howly Manufactured

GROBAN SUPPLY (O. .

femsf 🕝



sprays, old. Can be in



Combination AC power DC -exter

HOBART BROTHERS CO., BOX P-129 TROY OHIO. Phone FE 2 1223



S POWER
PLAUMINATED MAGNIFIER
Uniting fertilisate Business for stranger large of any major of
tophathance or some more, threat has 10 and types and up uniques
a by the develop group, Rody modula two Blank gar leaders as a

695

TELESCOPE

Sporting Science and Books of Common promote from the Books of Common Principal Common property on Principal Common physical com-

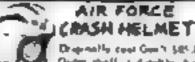
tens, 25 person water Fictions. Factor at whom in \$241, at 1000 person, \$20 volume

SEE ELSOW SCOPE
Her a a shiper se love, a
Katter ayearen der m
Amer seert og grade. The
seven hom reticts a Harn
rested Her 2 Bur hom
insted Her 3, 416, 988
or 600 446.

To DRDEE Send shock of M.Cl. 1 2 days with C O.D or AH Mours obspeed freight to prechape Collect.



101 ANGELES SE CALF



Drapmatty cout Gon't 501.20 Their shall a durable high legact placers: Inside is perfect and to the both their states. Small and large, ideal for both rice as

VICKERS 1990 PSI PULP He IN-PEAURI 2525

Panelson d'aptenment type pare. Bill displace. 256 color et au ren, Pressure unit à 1501 par 1750 BPM

1500 File Dier Annehm HYD CYLLINDER Here 2:1 B. have 9 strate 1 g' about 10's optio Green agency, \$75.

Ho. 10-53AM = MEW 53A W Ho. 10-33AM = MSEO , 17 AD

MOTE: To stock world's largest reguly of Hydrophic Equipment, jugaters launad.

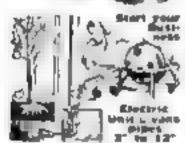
nahi-

# CLOGGED SEWERS A REMEMBER THE COSTLY PLUMBING DILL

string to

n-It





Note that the state of the product of the state of the st

Another new unit in the Militar Electric Rodder which has patented emiers that expand automatically 16 the size of the p political terms and heavy observations of pick districted and heavy observations of pick districted and heavy observations of pick districted with a COSTEY PLUMBING SILLS SAVED Teaching and one is the FREE SOURLET on Hand and Flectric (note that are no Agent will call the post curies 1 to Chicago Phone & Pare 2 1762)

Miller Sower Red, Dept. PS-12, 4649 M. Control Ave., Chys. 10, 10,

# ADMINIANA MITER BOX & CORNER CLAMI



248 POPULAR SCIENCE DECEMBER 1959

## New Bubbles Are Big Business [Continued from page 93]

orea. Actually it depends on the wettability of some materials and the water-repellency of others. Crushed ore itself is highly wettable, but adding certain chemicals makes the desired minerals less so. Accordingly, they latch onto the bubbles, which hoist them to the surface to be akummed off and sent to the refinery.

Crowd enough bubbles together and you've got a bubble bath—or a foam. Add a foaming agent (yeast) to dough or batter and the bubbles form the typical cell structure of bread and cake. Add other bubble-generating agents to rubber and plastics and you've got another kind of cake—those wonderful foam rubbers and foam plastics that have added so much convenience to modern living

A newcomer is foam aluminum. Full of bubble cells like sponge rubber, the metal floats, can be sawed and nailed like wood, and is completely indigestible by termites.

Or simply take foam as foam, a wet frothy blanket of bubbles by the billion. Shoot it out of some 900 nozzles at the rate of 10,000 gallons a minute. It will smother anything, especially fires.

But foam is a problem, too. When it builds up in a car's automatic transmission, shifting becomes erratic. The reason is simple: Foam, bulkwise, is mostly gas, but it's the mechanical, pump-driven force of the fluid that powers the wheels. Consequently, this power is reduced as the foam gradually replaces the fluid, cutting the transmission's efficiency. True, foaming is effectively controlled by antifoam additives, but transmissions heat up during driving, and the additives are gradually broken down—one reason why your transmission fluid should be replaced every 20,000 miles or so.

Tiny bubbles are a nuisance in a legion of industries. In canneries they foam up in tomato-juice vats. Result: cans only partly filled.

Wood pulp foams heavily as it feeds into paper-making machines, sometimes overflowing to the floor. Foaming in drilling mud (the clay or bentonite suspension used to lubricate oil-well drills) can be disastrous. The mud has a double job—it also acts as a plug, holding down the gas in a well during drilling. If gas bubbles foam in the mud and lower its

## **Now Bubbles Are Big Business**

density to a critical point, a "blowout" occurs, with gas, mud, sand, and rocks blasting skyward.

Foaming is troublesome in (among others) the textile, leather, plastics, rubber, wax, asphalt, paint, glue, pharmaceutical, and wine industries.

Cavitation bubbles raise more difficult problems. They form when a liquid is disturbed by some obstacle. This obstacle can be part of a containing surface, such as the inside of a pipe, or a body moving within the liquid, such as a pump impeller. Or the liquid can be disturbed by heat, as in boiling. The disturbance fractures the liquid and vapor rushes into the cavities, producing cavitation bubbles. These events are all but instantaneous, the bubbles collapsing almost as soon as formed, the vapor rushing back into solution. But their collapse packs a definite if momentary and highly localized wallop. During that split second, the temperature generated by the collapse of a single tiny cavitation bubble has been calculated at 3,000 degrees F.!

All this adds up to violence, countless small hammerlike blows that attack and erode the hardest substances. Ocean liners have returned to drydock after a single round trip, their propellers so chewed that they had to be replaced. The destructive little bubbles pepper New York City's municipal water system with 4,000 holes in an average year. They ate 18 inches of concrete out of one dam spillway in less than 24 hours. They gouge holes in diesel cylinders, wreak havoc in boilers, turbines, centrifugal pumps.

Look at the pitting inside one of your wife's older aluminum saucepans, Bub-

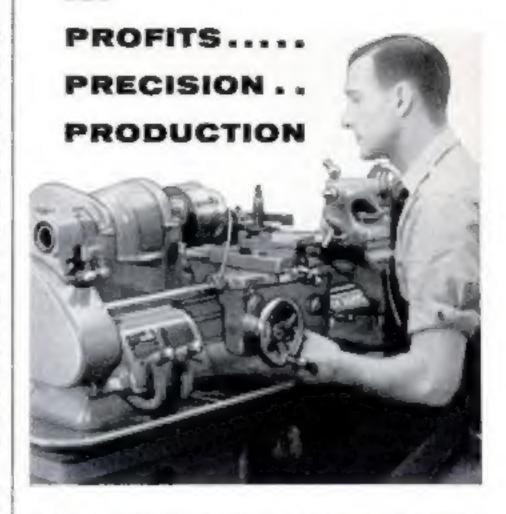
bles did that, too!

Small wonder that top scientific and engineering brains are studying the ways of these bubbles—finding better shapes for conduits, better designs for pump impellers and ship propellers, new harder and smoother materials for surfaces usually attacked. Steady progress is reported in both the theoretical and practical phases of the battle against cavitation.

Strange phenomena, bubbles! Complex enough to command the best efforts of scientists, yet simple enough to delight a child. So fragile, yet so powerful. So useful, yet so destructive!

# SOUTH BEND

for



BENCH LATHES-9", 10-K and 10" sizes in independent change gear, quick change gear and toolroom models.

FLOOR LATHES-9", 10-K, 10", 13", 1414", 16" and 16-24" eizes in quick change gear and toolroom models—129" maximum between centers on 16" lathes.

TURRET LATHES-10", 13" and 16" sizes with 1-1/16" collet capacities.

MILLING MACHINE-Vertical spindle type with universal 360° swivel head.

BINCH SHAPER-7" stroke. Only shaper of this size with pressure lubrication system.

DRILL PRESSES-14" precision type in bench, floor and multiple spindle models.

PEDESTAL GRINDERS-8" and 10" wheel mises. More room for work and for hands.



### WRITE FOR CATALOG

Fully describes and illustrates all the features of the above machines plus many tools, attachments and accessories.

SOUTH BEND LATHE SOUTH BEND 22, INDIANA Building Better Tools Since 1906



# New Radio Telescope is Man's Biggest Machine

[Continued from page 86]

Docks. The Naval Research Laboratory will run the station when it is finished.

This imaginative engineering would go for nought in a hurricane, of course. So years before construction started, Navy crews combed the country for a location that was secure against severe storms and earthquakes; and even more unusual, free from man-made radio interference (even an electric razor could mess up the radio telescope).

The perfect setting. Sugar Grove, W. Va. (pop. 21), near the town of Brandywine, filled the bill. As far back as the records go, no hurricanes have ever hit the valley in which it lies. Nor tornadoes. Nor earthquakes. Rainfall, snowfall, and winds are all moderate. The worst is a rousing thunderstorm.

More valuable yet, Sugar Grove is also placid electronically, remarkably free of the radio noise that comes from engines, transmitters, receivers, and power lines. It has no airline route overhead and no high-voltage lines. It is off the line of radar stations and microwave communication networks. Radio and TV stations are either far away or screened by mountains. The nearest busy highway is Route 11, on the other side of the mountain.

Zone of quiet. The Navy made sure that Sugar Grove's ether remains unsultied. The Federal Communications Commission established a zone of "radio quiet" for 1,000 square miles around (only 30 miles away will be another, smaller radio telescope for scientific research, and it needs similar protection). The Federal Aviation Agency is rerouting airplanes to bypass the area.

As a clincher, the West Virginia state legislature obligingly passed a law that strictly controls interference from every kind of electrical device—TV sets and ham radio transmitters to neon signs and furnace thermostats. The law is so tough that the area for two miles around the research station is practically off limits for new business establishments—the cost of shielding motors and other equipment would be prohibitive. People who are already there have to comply with the noise regulations, too, but they'll get help from the Government.

The Navy will install elaborate shielding for its own machinery, bury its phone and power lines, and locate housing and shops four miles away.

What is the universe? To scientists, this elaborately expensive installation promises hints about simple questions that little boys ask and erudite philosophers can't answer with certainty: What is the universe made of? How did it get that way?

The front-running theory is the work of the University of Colorado's George Gamow (rhymes with ham off), a humor-loving physicist who slips puns into the Physical Review and writes amusing books. Gamow says that creation occurred about aix billion years ago. All the parts of the universe were then concentrated into one super-super atom. This exploded in a split fraction of a second, sending the parts flying out every which way. Some of the parts formed into stars and whatnot, but are still flying apart.

An opposing theory is championed by another scientific maverick, Cambridge University's Fred Hoyle (he writes novels). According to Hoyle, creation was no instantaneous affair, but a continuing process that is still going on. He thinks that the simplest atoms, hydrogen, are always being formed throughout the universe. They can condense into stars.

If Gamow is right, the universe stops about six billion light years away—that's as far as the fragments of the original explosion could have traveled by now. The new radio telescope will "see" much farther than that. If it turns up a lot of nothing beyond the six-billion-light-year distance, Gamow wins a point. Hoyle's theory, on the other hand, implies that the telescope will detect something as far as it can reach and that something will be a cosmic fog of hydrogen.

The Navy, while willing to lend its mammoth instrument to astronomers for an occasional glimpse at the edge of the universe, would dearly have loved to keep the project secret. But how can you hide the biggest machine in the world?

Now the Navy is beguiling the residents of Sugar Grove with visions of a profitable tourist attraction. Officials point to good lookout locations, off Government property but near enough to give visitors a breathtaking view of the newest wonder of the world.

### PORTABLE LIGHT PLANTS

PORTABLE LIGHT PLANT
113v. 00 cyc. AC Push Butten Start. Powered by 3
4 fip. Clinton engine.
Combines big output with
easy portability. Provides
emergency power for operating any oil burner,
sump pump, freezer,
twievision, lights,
communications gystense up to 1500 watts.
Them 12v. Wt. 110 lbs.
Reg. 4475 value. Pactory price...
1750 Watt Plant Powered by 4.5
frine. Electric starting & battery
charging built-in Factory price...
MASTER-LITE 2300 Watt Plant
110/120 v. 50 cyc. AC. A powerful joint, ruggedly communicated
and yet designed for easy petability. Can be started by ease
or lolit-in 12 v. ciectric coast butten startor. Built-in winding,
to charge leastery,
Powered by a but 1.10
tip Sriega cogins
complete with all

\$239.50 \$279.50

Powered by a bit 5.10

IIP Sriggs regime
complete with all
eccuspries. Includes
control box, voltmeter, and handy plug-in power receptarie. An ideal
plant for permanent or stand-by service. Wt. 725

Ih, Reg. price 846,00
(Hem 21) Factory Price

# GIANT METAL SHEARS

"PEXTO" Nius inch cutting blade made of special high carbon alloy steel, periectly aligned and ground. Easily cuts size plate up to 12 gauge or 1/2" thick, Overall length 40". Wt. 25 ibs. (Rem 154) Regular \$14.55

EXTENSION CORD

2 Conductor No. 14 general purpose power cable, Neoprene lacket. very flexible; 100 ft. complete with male and female ft. tings. (tem (#5), \$8.98.

2 Conductor No. 12

Laker rugged service. Includes male and female fittings. (100 ft. item CU) \$7.28

3 Conductor No. 10 general purpose invertable, May be curied under ground if thentred. Standard forminal lugs on each end, New Surgelan-100 ft. lengths (tem cu2). \$13.98

200 ft. lengths (tem cu2). \$13.98

200 ft. lengths (tem cu2). \$13.98

3 Conductor No. 8 extra heavy duty power cable. Nextbed (0 bugh fishible Nextbed) and the cu2; \$13.98

3 Conductor No. 8 extra heavy duty power cable. Nextbed (0 bugh fishible Nextbed) and the cu2; \$13.98

3 Conductor No. 8 extra heavy duty power cable. Imporvious to soil, such and water, May be used above grained as a general purpose power cable or may be buried for ondergrand earlies. Ends scolpped with heavy lugs. 100 ft. length (lines cc0). \$33.90

# Double Acting Hydraulic Cylinder



HYDRAULIC KIT

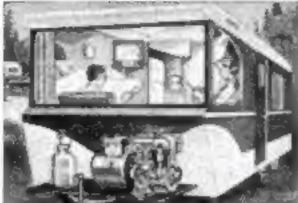


Complete Hydraulic Rit consists of (a) hydraulic hand puttin which develops 1500 pot and displaces 1.5 cu, in, per stroke, (b) separate 2 gai, reservoir. (c) item 602 double acting cylinder described above, (d) Release Valve. (e) 2 hydraulic house to connect pump to reservoir. This kit is ideal for rame, presses, lacks, snowplows, etc. 4 is terrific

es, jacks, snowplows, st., value at litem 836, Weight 40 lbs. Rit less cylinder—Ibom 836s,

MASTER MECHANIC'S

BEDROCK FACTORY PRICES



700 WATTS

TOO WATTS

PUSH SUTTON START

115 v. 60 cyc. AC

Powered by a rugged

3.3 HP easy starting

Integra entire. No

wiring necessary;

just plug in and operate Plenty of current for any oil hurner, freener, broader,
emergency lights,
etc. which require

to to 700 watta, Ideal for television and
radios. Complete with Volumeter and huiltin winding to charge 0 v. auto battertes. Hern

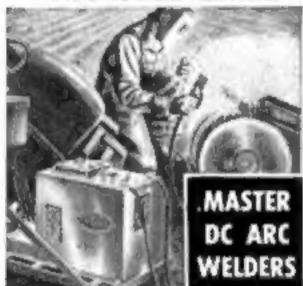
34.1 Wt. 75 Hm. Easily fits in cur trush,
he prevared if storm brocks out. \$143.50

1200 Watt Plant (Hern 45; same as Hern 24

but larger generator and singles. \$199.50

We make every type and size of fight stants. We make every type and size of fight plants.

— Write giving so your requiremental





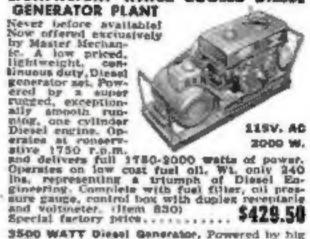
THE POWER MASTER

(stem \$30)

(stem WELDER ONLY-INDUSTRIAL MODEL name as

above but with ceremic rotary type riscount providing 74 different heat settings for all types of webling (Item 38b) \$139.50 \$500.00 value \$2500.00 value \$139.50 \$100.00 value \$2500.00 v 

LIGHTWEIGHT WATER COOLED DIESEL GENERATOR PLANT



3500 WATT Diesel Generator, Powered by blg 0 HP water cooled diesel. \$795.00

CHARGING GENERATOR Push Button Start



A busky, 750 west plant idesigned for bettery charging only) that will charge 6 or 12 volt

HEATING & VENTILATING FAN

Oltem 10) Easily installed in furnace pipes. Forces even beet to all forms. Over range removes kitchen smoke and oders. Powerful, runtiques duty motor, 110-120v, AC. Mount in wall of colling to want filter any area. Quiet, super-efficient fan moves huge volume of gir, (400 to 800 CFM.)

BEAVY BUTY FAM. Semi-enclosed motor, spitcable for apray booths, restaurant exhausts, poultry houses, etc. 10" Fan. Wt. 5 ths. (Rem 100) ....\$11.95



Nexts instabily northing from a cup of water to a washing full— much faster than any stove or co-til beater. Indispensable for laudidry, dishes, baths, etc. Terrific for coftee, ten, some, Made of utbreakable shock proof "Nralite." Simple and cheap to operate. Just ping it in, 1200 waits, 115 v. A.C. Money back transmisse, 21cm \$2.55

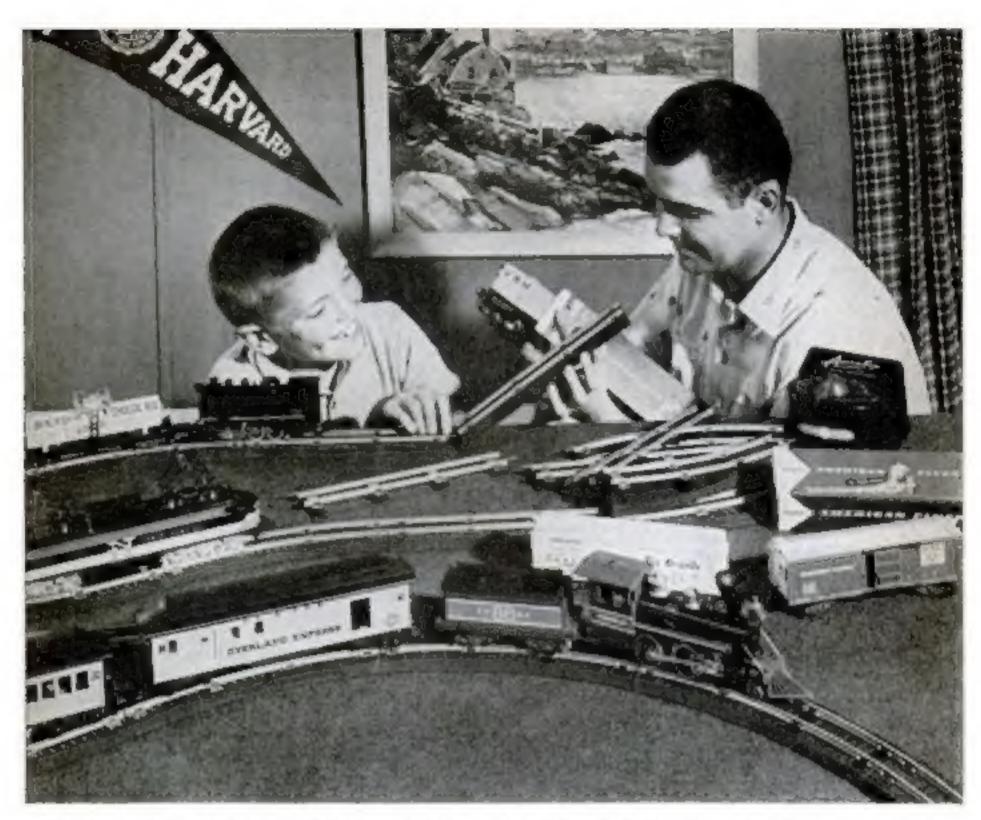
### JET STEAM MASTER

Now, a super effi-cient nortalde steam generator that pro-duces live steam of 100 lbs. pressure in 80 seconds from a cold start! Produces large volume of high pressure sleam on 2

pressure sleam on 2
Nibis of fuer oit. Instantly cleans sticky
grease, dirt. rust.
old paint, etc. off
implements and road
grachtnery. Pays for
itself in a few steess.
Sterilizes soil. Sterlittee as it cleasumilt equipment, etc.
Fully automatic—oil fired with new, built-in
lifetime bronze water circulating pump, Draws
water from faucet or bucket. Simple and safe,
suppose cap use it; built-in safety valve,
Consists with 12 ft, of hi-pressure attam
bose and new triple efficiency steem cun that
automatically mixes in some anlution if desired. Wt. 250 lbs. Item 465.

Special factory price.

Southern Customers Order From Dept. B-125 Box 65, Saraseta, Fig.



# HOW TO HAVE FUN WITH YOUR SON (and vice versa)

Building an American Flyer railroad is about the most enjoyment and companionship—a boy and his father can have. Together you lay out the track, locate the freight yards, plan the landscaping and run your trains with "on time" scheduling.

This year, American Flyer features the most exciting train ever, the colorful funnel-stack "Frontiersman" of the 1850 era. With certificate at right, purchase of this train entitles you to FREE "Overland Express" Baggage Car, worth \$6.98

# **AMERICAN FLYER TRAINS**

Made by The A. C. Gilbert Company New Haven, Connecticut



Copyinghed material